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THE
Natural HISTORY
OF
Mount *VESUVIUS*,

WITH

The Explanation of the various *Phenomena* that uſually attend the Eruptions of this celebrated *Volcano*.

Tranſlated from the Original ITALIAN, compoſed by the *Royal Academy* of *Sciences* at NAPLES, by Order of the KING of the TWO SICILIES.

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BRITISH MUSEUM

DEDICATION.

TO THE

KING of the *Two Sicilies*.

SIRE,

IF *the laſt Conflagration of* Veſuvius (*as we have Reaſon to believe*) *happened, by the ſpecial Direction of Providence, at the Beginning of your Majeſty's Reign, that you might diſplay to your Subjects, and the whole World, that Generoſity, and that Love of* Science, *of which, on this Occaſion, you have given ſuch glorious Proofs; it ſeems equally juſt to conclude, that it is not without the ſame favourable Interpoſition of Heaven, that this Hiſ-*

tory, retarded in its Publication by ſeveral Accidents, now appears at the Time your Majeſty has fix'd your Reſidence at * Portici. *We flatter ourſelves that theſe Memoirs will here carry a more familiar Aſpect, than in a remoter Climate, and that they will be the more agreeably received, as all the circumjacent Territory preſents to the Eye innumerable Tokens to eternize the Hiſtory of* Veſuvius, *and its remarkable Eruptions.*

Nor ought this Interpretation to be conſtrued as a Pretence frivolouſly form'd to excuſe our Delay, which no doubt has been cenſur'd; much leſs with the View of putting a myſterious Air on what regards your Majeſty's ſacred Perſon. Nothing would be more unjuſt than the latter of theſe Reproaches,

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* A Palace built at the Village of *Portici,* near the Foot of *Veſuvius.* (*See the Perſpective of the Mountain, Tab.* I.)

proaches, as we have been convinced, by a thouſand Evidences, of the wonderful Succeſs that attends your illuſtrious and noble Deſigns: Of theſe the World ſpeaks too loudly, for us to preſume to add any Weight to the concurrent Teſtimony of Mankind.

As to the former Reflection, we muſt own, that when we conſider the Nature of our Performance, and the Imperfections it labours under, we might ſeem chargeable with Temerity, if, to cover our own Weakneſs, we ſhould call in the Aid of thoſe ſupernatural Cauſes which GOD *has only conſecrated to accompliſh your Majeſty's arduous Undertakings.*

To ſpeak, therefore, more properly, we look on it as a particular Favour of Fortune, that we have the Honour to lay our Work at your Majeſty's Feet, at a Juncture when your Lei-

ſure gives us Room to hope for its gracious Reception, and that it may ſerve as an Amuſement to your Royal Retirement.

With this View it is, that inſpir'd with a reſpectful Confidence, and encourag'd by the repeated Teſtimonies of your Royal Goodneſs, ever ſtudious by new Methods, to cultivate and perfect uſeful Arts, we approach your Throne: We feel a conſcious Pleaſure in our Endeavours, from the Joy that ſo great a Prince condeſcends to approve and accept them; and in this Diſpoſition we humbly beg Leave to conſecrate to your Majeſty, with Sentiments of the higheſt Duty and Veneration, this Collection of Obſervations on the Eruptions of Veſuvius.

If this Work is ſo happy to obtain your Royal Approbation, we perſuade ourſelves it will protect us from the Aſſaults

Aſſaults of thoſe Critics who may either accuſe us of violating the Rules of Taſte, by neglecting to explain the ſecret Cauſes of the Phenomena we relate, or of others, who, carrying their Delicacy higher, may blame us for having explained our Thoughts in too tedious a Manner. We ſhould have ſtudied Brevity more, had we deſign'd this Work only for the Learned.

We acknowledge freely to your Majeſty, we are ſenſible that our Labour is defective, and that the Subject is ſuch as affords Room for many Obſervations and Experiments, beſides thoſe we have related, and when we confeſs our Weakneſs in ſo auguſt a Preſence, we own it as confeſs'd to the whole World.

After all, if our Work has any Merit to recommend it, or our future Eſſays produce any Advantage to the Pub-

Publick, we muſt aſcribe the Glory as ſolely due to your Majeſty, whoſe auſpicions Protection is capable of reviving our feeble Spirits, and animating us to purſue that Perfection in Science, by which we may in ſome Degree contribute to the Luſtre of your Majeſty's Reign, and the Honour of the Neapolitan *Nation.*

In Expectation of ſo fortunate an Iſſue, we beg Permiſſion to ſhelter this Work, Ourſelves, and our Studies, beneath your Majeſty's gracious Protection, offering, at the ſame Time, our ardent Prayers to GOD *that he would continue to bleſs your Royal Perſon, your Family and Government, with a Series of the ſame diſtinguiſh'd Felicity that has hitherto attended the Courſe of your happy Reign.*

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THE NATURAL HISTORY OF Mont *VESUVIUS*.

INTRODUCTION.

COmmerce, to which Society is indebted for its Baſis and Support, takes its Riſe from the wiſe Diſpoſitions of Nature. As ſhe has not made an equal Diſtribution of her Benefits to all Nations, hence ſprings

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that tacit Accord, by Virtue of which we yield to the Wants of others the Surplus of what we have to ſpare, in return for the Commodities with which they abound. Hence ariſe thoſe mutual Exchanges which maintain Union and Correſpondence between particular Men, as well as a friendly Intercourſe between different People.

A like Communication ſeems neceſſary for the Increaſe and Advantage of that particular Society, in which the Learned, as ſcattered thro' the World, yet ſeem all Members of the ſame Family. Reaſon requires, as well as the publick Good, that we ſhould mutually impart the Diſcoveries we make by our own Obſervation, and contribute in this Sort to the Advancement and Increaſe of Univerſal Knowledge.

As this laſt Kind of Commerce is more noble and free than the former, ſo it is much ſooner and eaſier carried into Execution. In common Trade, whether the Effect of Luxury or Traffick, as what we give to another, is no longer our own, ſo no particular Commodity can paſs into another Country without leaving ſome Deficiency in that from which it is exported. But in a literary Traffic, the Caſe is quite different, for the Knowledge we communicate remains ſtill our own as much as before, or rather acquires a new Value and Uſefulneſs the more it is diffuſed.

Beſides this Advantage, there is yet a further Argument for the Neceſſity of a literary Correſpondence. All Men are not endued with an equal Share of Genius or Underſtanding, all are not equally capable of arriving at the Knowledge of abſtracted Truths. Some want ſufficient Penetration and Judgment; others have not the Aſſiſtances abſolutely neceſſary for ſuch important Diſcoveries. For this End we are often obliged to make uſe of the Labour of others, and take up Credit from preceding Authors, to ſupply the Deficiency of our own Stock.

Now, if this be undoubtedly true, with reſpect to Learning in general, it is certainly the ſame in Natural Hiſtory, which is nothing but a Series of *Phenomena* and Appearances, often widely different from each other, both with regard to Time and Place.

If in this Caſe, we ſhould confine ourſelves to the Teſtimony of our Senſes, and the Lights we might receive from a few Obſervations made in one particular Spot of the Earth, We ſhould contract the Wonders of *Nature* into miſerably narrow Bounds. Great and immenſe as She is, even in her ſmalleſt Productions and ſlighteſt Operations, ſhe would ſoon grow neglected, by that dull Attention our Indolence would beſtow on her Works. To prevent this, ſhe takes Care from Time to Time to awaken our Curioſity by ſome extraordinary and ſtriking *Phenomenon*. Nor does ſhe content herſelf with ſurpriſing us by ſuch uncommon Appearances only, but ſhe delights in different Climes of the World to dart ſuch luminous Rays as ex-

expreſs viſibly her Grandeur and Magnificence, and ſerve as perpetual Proofs of her Power and Wiſdom.

There are many Countries, where (if I may ſo ſpeak) Nature thus takes Pleaſure to unveil herſelf, but perhaps there is not one, which, for the Variety, the Number or Importance of the *Phenomena* exceeds the Kingdom of *Naples*. We ſhould not aſſert this ſo confidently, if it were not a Truth generally allowed by all the Connoiſſeurs in Phyſics.

Of all the Wonders our Country abounds with, *Veſuvius* is undoubtedly the moſt aſtoniſhing. This Mountain is ſituated Eaſtward of the City of *Naples* at ſome Miles diſtance. Its continual Fires, and dreadful Eruptions both antient and modern, have afforded the *Literati* in all Ages, ample Matter for Reflection and Writing. And as theſe Inflammations ſeem inextinguiſhable, and new Eruptions conſtantly ſucceed the old, our modern Philoſophers have a ſufficient Subject to employ their Thoughts, as well as thoſe who have wrote before them.

Convinced of this by our own Experience, we have attempted to give the Publick a faithful Narrative of the laſt and terrible Conflagration which happened in the Month of *May* 1737. To this we ſhall join the Obſervations we made with the utmoſt Exactneſs, and illuſtrate them with proper Reflections in the beſt Manner we are able. Thus ſhall we diſcharge the Duty we owe the Learned, by communicating our Diſcoveries, as well as that we owe our Country by tranſmitting them to Poſterity. We are indebted to our Anceſtors for what we know of the former State of our *Volcano*, and the only Method we have to repay the Obligation, is to inform future Times of what has happened in our Days.

We are ignorant as yet what Reception this Work may meet with, but we hope the Publick will judge candidly of our Undertaking, by which we only propoſe to make a Collection of Obſervations, a ſimple Fund of Materials, of which ſome abler Hand may take the Advantage; juſt as ſome Nations who have not Skill to improve the Riches of their own Growth, leave Foreigners to bring them by Art to the beſt Perfection.

By undertaking this Deſign, we have endeavoured to anſwer the End of our Inſtitution*, the Illuſtration of Natural Philoſophy; and we do this the more willingly, as the Learned abroad want the Advantage we poſſeſs of being Eye-witneſſes to the *Phenomena* of *Veſuvius*. We are yet ſupported in it by a nobler Motive, a Motive capable of animating our Weakneſs, the Ambition of contributing by our Labours to the Glory of the Reign of our Sovereign, Don *Carlos*.

Since the happy Day, in which this Prince, one of the wiſeſt and beſt that ever bleſs'd the World, was rais'd by

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* The Royal Academy of Sciences at *Naples* was founded by Don *Carlos*, the preſent King of the *Two Sicilies*.

Heaven to the Throne of the two *Sicilies*, we have enjoy'd a Felicity, ſurpaſſing our Hopes or Deſires. Amongſt thoſe important Cares which employ his comprehenſive Thought, he has made it his Concern to encourage Commerce, and to cultivate Arts and Sciences, by his Royal Beneficence and Protection. As our Country abounds with all the Bleſſings of Nature, it is his Deſire that in all other Reſpects we may have no Occaſion to envy the Splendor or Happineſs of other Nations.

It became us therefore to ſhew that the Generoſity of ſo great a Monarch, was at leaſt beſtow'd on Hearts incapable of Ingratitude, and to demonſtrate by ſome Effects, that his heroic Views for our Benefit were not fruitleſs. We ſhould look on our Indolence as criminal, if it detracted from his Glory.

Influenced by ſo powerful a Motive, we have only to wiſh that our Succeſs were anſwerable. But even though it ſhould fall ſhort of its Aim, we flatter ourſelves the Equity and Candour of the Learned will make ſome Allowances for an Eſſay of this Nature. The Severity of Cenſure, they know, can only tend to diſcourage laudable Attempts. In Science, as in Arts, the weakeſt Efforts are preferable to Indolence, ſince nothing good can come of Inactivity, whereas, on the contrary, we have often ſeen a happy Iſſue ariſe from Beginnings at firſt both imperfect and unſucceſsful.

We now return to our Subject. In order to clear this, it is proper to give a Sketch of ſome Things that may facilitate the Underſtanding what happened in the laſt Eruption of our *Veſuvius*, even tho' at firſt Sight they ſeem to bear no Connection with the Eruption itſelf; we ſhall therefore lay before our Readers the Temperature and Nature of our Soil in general.

The Kingdom of *Naples* in moſt Places abounds with vaſt Quantities of ſtrong Minerals, eſpecially ſuch as are moſt ſubject to Inflammation, and moſt capable of preſerving a long Time the Heat they have once contracted; to this

Cauſe it is owing that our Provinces in all Ages have been ſo ſubject to natural *Accenſions*, or Conflagrations.

A Plenty of Sulphur, Bitumen, Nitre, Allum, Vitriol, and Salts of every Kind, as well as Minerals of a more exalted Quality, is evident from the cleareſt Proofs, ſuch as the Mineral Springs that frequently occur to the Eye, and the innumerable Places where theſe Minerals appear on the Surface of the Earth, either by mere Chance, or by the eaſy Induſtry of the Inhabitants, who make a Profit of their Diſcovery.

Whether from a cloſe Mixture with each other, or ſome latent Cauſe, it is certain theſe Mineral Subſtances are in their own Nature readily accenſible, or ſubject to kindling even to a Degree of Inflammation; whoever is in the leaſt acquainted with Chemiſtry, and the ſtrange Effects that attend the Operations in that Science, will readily agree: And this Truth is further demonſtrated by the Heat of our Mineral Baths, and the Flames that frequently are ſeen to iſſue out of the Earth near their Springs; a manifeſt Sign that the Soil of thoſe Places is more deeply impregnated with Minerals than elſewhere.

From theſe Conſiderations we may venture to affirm, that the *Neapolitan* Soil is full of the Seeds, or firſt Principles of Fire. At leaſt it would be hard to prove the contrary: Whereas a thouſand repeated Experiments confirm the firſt Aſſertion, of which we ſhall not enter into the further Diſcuſſion at preſent.

However, this Opinion ſhould be far from alarming any one, or frightening Strangers from our Climate; as it is to the fiery Quality of the Soil, we are indebted for the prodigious Fertility of our Lands, the Purity and Wholeſomneſs of our Air and Water, the Virtue and Efficacy, as well as the Variety of thoſe Remedies for Health, given us by Heaven, in our Mineral Springs and Baths; in a Word, for all thoſe Advantages, that have given *Naples* the Reputation of the moſt agreeable and healthy Country in *Europe*.

Be this as it will, it is eaſy to imagine, how ſuch inflammable Materials as theſe ſcatter'd and hid beneath our Soil, have increaſed and amaſs'd themſelves in ſome particular Place, where by the Aſſiſtance of ſome internal Motion they have catch'd Fire; and of Conſequence this Fire has ſplit the upper *Stratum* that confined it, to give Vent to its Rage, with all thoſe violent *Phenomena* that uſually attend the Eruptions of *Volcanos*.

In Imitation of this Operation of Nature it is, that the Chemiſts have contrived their *Aurum Fulminans* (a). This artificial Compoſition not only kindles at the leaſt Approach of any Thing hot, but it breaks out, thunders, burſts the Veſſels in which it is incloſed, and produces all thoſe violent Effects that have given it ſo terrible a Name.

(a) *Vid. Gaſſendi Lib. II. De Meteor. Cap.* 5. *Lemery Cours de Chemie, Part I. Chap.* 1.

In the ſame Manner, the celebrated *Lemery* made an artificial *Volcano*, by a Paſte compoſed of two equal Parts of *Sulphur* and *Steel-Duſt*, mixt up with a little Water. This he bury'd in the Earth at a proper Depth, and in about nine Hours, the Ground began to ſwell and open in ſeveral Places, from which iſſued a hot and ſulphureous Smoke, which in a few Minutes was ſucceeded by Flames. (*b*) Theſe chemical Experiments, with others of the ſame Nature, are ſufficient to explain what we have juſt now advanced, with reſpect to the natural Inclination of our Soil to Heat and Inflammation.

From what has been ſaid, it then appears, that the Sources of Fire have been ever found in this Country. Many of them have been bury'd in Oblivion, either becauſe their Force has been exhauſted Ages ago, or becauſe they were too weak to be of long Duration, or for other Reaſons which at preſent we can't aſſign.

(*b*) *Hiſt. de L'Academie de Sciences A°* 1700.

As we now behold on the riſing Grounds that lye about *Naples* to the *Weſt*, *North* and *Eaſt*, vaſt Quantities of burnt Stones, Aſhes, and other Bodies that bear viſibly the Marks of Fire, it has given Occaſion to ſome Authors (*d*) to think, that formerly theſe Places have ſuffer'd a Conflagration, the Memory of which Time has effaced (*e*).

Several other Places, ſuch as thoſe in the Neighbourhood of *Puzzoli* and the Iſle of *Iſchia*, all adjacent to *Naples*, ſhow to this Day the *Veſtigia* of theſe natural fiery Eruptions, which we find atteſted by antient Writers, yet for ſome paſt Centuries they have been free from any Accidents of this Kind.

In the Diſtrict of *Puzzoli*, how many Mineral Springs are to be found of the ſtrongeſt Sort? How many natural

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(*d*) *Vid. Thomas Cornelio* in his *Progymnaſma poſthumum de Senſibus.* pag. 50.

(*e*) There is another Conjecture, that theſe Stones, Cinders, and other burnt Subſtances, have proceeded from the Eruptions of *Veſuvius*, or ſome of the leſſer *Volcanos*, which infeſted the Territory of *Puzzoli* formerly, but have been long extinct.

tural hot Baths and Stoves of ſurprizing Efficacy? What a vaſt Quantity of Minerals ſuited to the Generation of Fire? Not to mention Objects yet more convincing, ſuch as Mountains naked, waſted down to the Form of Amphitheatres, which at firſt View ſuggeſts to the Mind, that their preſent Figure and Condition proceeds from ſubterraneous Fires that have conſum'd them; tho' theſe Fires have long ſince diſappear'd (*f*). Such are *Monte Barbaro*, antiently Mount *Gaurus*. The *Leborian Fields*, which the *Greeks* call'd the *Burnt Fields*, and the *Solfatara*, to which they gave the Name of *Vulcan*'s *Market*; this laſt emitted Flames in the Time of *Strabo* (*g*). All theſe Places at preſent exhale only hot ſulphureous Vapours, attended with a thick Smoke.

To theſe we may add, the famous

(*f*) *Vid. Camillo Pellegrino nel ſua Campania Deſcritta, Diſcors* II. *Cap.* 17, 18, 19.

(*g*) *Forum Vulcani, campus circumquaque incluſus ſuperciliis* ignitis, *quæ paſſim tamquam e caminis incendium magno cum fremitu expirant. Strab.* lib. v. p. 377.

Hill ſituated on the Banks of the Lake *Averno*, which we call the *New Mount*, becauſe in the Year 1538, after an Eruption equally ſudden and violent, it roſe at once: The Earth ſwelled, the Rocks and Aſhes thrown out by the Impetuoſity of the Shock, rais'd a Hill in their Fall, and the Place, which before was a Plain, became chang'd into a ſmall Mountain. (*h*)

The Iſland of *Iſchia*, the *Enaria* of the Antients, is full of the ſame Objects, innumerable Springs cold and hot, Minerals of all Kinds, ſeveral Spots they call the Burnt Grounds, in Commemoration of the Eruptions which have deſtroy'd them (*i*). *Strabo* ſpeaking of this Iſle, reports that the *Eretriſians*, a *Greek* Colony (*k*), its firſt Inhabitants were obliged to quit it, by Reaſon of the ſudden Eruptions of Fire, and Mineral Waters, which render'd

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(*h*) *Vid. St. Felice de origine et ſitu Campaniæ.*

(*i*) The preſent Inhabitants call theſe Places the *Terre Cremati. Vid. Janſolin de remedibus Iſchiæ.* lib. i.

(*k*) *Srab.* lib. v. *Geograph.* p. 379.

render'd the Place too dangerous for Safety.

By the Teſtimony of *Timæus* (as cited by *Strabo*) we find, that a little before his Time a Hillock call'd *Epopeum* (*l*), had roſe in the Centre of the Iſle, after a violent Earthquake, and vomited Fire and Flames. We alſo find, from the Works of *Villani*, (*m*) that in 1302, this Iſle ſuffer'd greatly by a Conflagration which deſtroy'd both Men and Cattle, and blaſted, in a ſurprizing Manner, the Face of the Country. To this we may add, that, according to the Obſervations of *Macrino*, there are diſcover'd here in ſeveral Parts (*n*) the viſible Marks of theſe fiery Torrents of liquify'd Minerals, and conſolidated by the Air, which we call *Lavangi*, ſuch as are frequently ſeen in the Neighbourhood of *Veſuvius*.

The Situation of the Iſle of *Prochyta*, affords another Proof of the ſubterra-

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(*l*) So *Cauſabon* corrects the Word *Epomeon* in the Text of *Strabo*, lib. v. p. 380.

(*m*) *Villani iſtoria di Fiorenza*, lib. viii. cap. 53.

(*n*) *Macrini tractat. de Veſuvio*, cap. v. p. 41, 42.

terraneous Fires that have formerly raged on the Weſtern Shore of *Naples*, eſpecially if it be true, that our Anceſtors gave it that Name from the Greek, (*o*) on Account of its being diſmembered from the Continent of *Iſchia*, to which it was before join'd; or rather becauſe it was by ſome Exploſion of this Sort, forc'd up from the Sea, juſt as we ſee a young Scyon riſe at the Foot of an old Tree; which laſt agrees better with the Etymology of the Word (*p*).

We ought not to look upon the Account of Iſlands thus emerging from the Sea by the Force of ſubterraneous Fires, as a Thing fabulous, ſince, to omit other Relations, (*q*) we find by the Teſtimony of the ancient Geographers (*r*) and Hiſtorians, that the Iſle of *Santorini* in the *Archipelago*, roſe from the

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(*o*) *Strabo in loc. citat. Prochyta pars a Pithecuſis avulſa.*

(*p*) Prochyta *non ab* Eneæ *nutrice, ſed quia profuſa ab* Enaria *erat*, ἀπὸ τοῦ προχυεῖν, *profundere. Plin.* lib. iii. cap. 62.

(*q*) *Vid. Tournefort voyage du Levant.* chap. 6.

(*r*) *Vid. Strabo,* lib. vi. p. 396. *Plin.* lib. ii. cap. 89.

the Ocean in this Manner. Since that Time ſeveral leſſer Iſlands, or rather large Rocks, have ſprung up near the Coaſts, of which an Inſtance happen'd in the preſent Century (*s*). That theſe are the Effects of ſubterraneous Fires or Inflammations, appears from the Flames that on theſe Occaſions riſe out of the Water, as well as the Aſhes, Pumice-Stones, and other burnt Subſtances thrown by theſe Eruptions on all the neighbouring Shores.

Now if Fire can thus from the Bottom of the Sea both force up to the Surface ſuch a Quantity of Rocky Subſtances, and unite them ſo, as to form an Iſland of no inconſiderable Circuit, we may much more eaſily ſuppoſe that it can break a Paſſage thro' an Iſthmus, ſo as to make two Iſlands of one, or ſeparate two Parts of the ſame Continent. This gives us Room to imagine, as many do, that *Iſchia* and *Prochyta*, formerly made but one Iſland, and that even before that,

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(*s*) In 1707 ſee *Tournefort*'s Voyage, chap. 6.

that, they were a Peninſula join'd to the Continent near Cape *Miſeno* (*t*).

The Situation of the Iſland of *Caprea*, gives Room to the ſame Conjecture, that it was torn off from Cape *Maſſa* (*u*), antiently call'd the Promontory of *Minerva*. *Sicily*, large as it is in Extent, has been ſuppoſed to have join'd the farther *Calabria*, when by ſome violent ſubterraneous Shock it was diſmember'd in the Manner we behold it (*x*); and it has been thought that the Town of *Reggio* took its Name from this celebrated Event, to perpetuate the Memory of (*y*) the Separation.

And as the natural Phenomena which happen in one Age and Climate, atteſted by ocular Demonſtration, give us a Rule by which to judge of preceding Events, ſo we find the Senſe of

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(*t*) *Vid. Strabo,* lib. vi. p. 396. *ante citat.*

(*u*) *Vid. Srabo ibid.*

(*x*) *Claudian* —— *Trinacria quondam*
Italiæ pars una fuit—*ſed Pontus & Æſtus*
Mutavere ſitum.
Vid. Plin. lib. ii. cap. 9.

(*y*) *Strabo, loco citat. Nomen a verbo* ῥηγνυσθαι *quod eſt* rumpi *deductum videtur.*

of the antient Authors have thus accounted for the Disjunction of the two great Quarters of the Globe we call *Europe* and *Africa*, by the Straits of *Gibraltar* (z).

To return to *Veſuvius*, the Object of our Enquiry: What we have ſaid ſhews that there is great Likelyhood, that the Territories of *Puzzoli* and *Iſchia*, as well as ſeveral other Countries were formerly ſubject to Conflagrations, but the Diſtance of Time makes theſe Proofs weaker, whereas the Caſe is quite different with *Veſuvius*, whoſe Fire has preſerved itſelf unextinguiſh'd from Time immemorial as it is at preſent.

Situated as it is by itſelf, ſeparated from that grand Chain of Mountains that runs thro' *Italy* by the Name of the *Apennines*, *Veſuvius* lies on the Shore of the Bay of *Naples*, to the Eaſt of that City. The Plains that ſurround it form the moſt charming

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(z) *Plin.* lib. iii. cap. 1. *Mela de ſitu orbis,* lib. i. cap. 5.
Sic & Hiſpanias a contextu Africæ mare eripuit. *Seneca natur. quæſt.* lib. vi. cap. 29.

Proſpect, and the Air is remarkably wholeſome. The Fields are covered with Fruit-Trees of every Kind, or Vineyards that produce excellent Wines. The lower Parts of the Mountain are no leſs fertile, and as much diſtinguiſh'd now on that Account as they were formerly.

But when you aſcend a little higher on the South and Weſt Sides, the Scene alters, and ſeems calculated to inſpire Horror. Not a Shrub or Spot of Verdure to be ſeen, nothing preſents itſelf to the Eye but Aſhes, burnt Stones and Pumice, that carry the viſible Marks of the Fire that has produced them.

In the Place where the Mountain begins to wear this diſmal Aſpect, it divides itſelf into two Parts, detach'd from each other. In the Front appears a Chain of riſing Grounds which ſtretch themſelves to the Eaſt and North, whoſe external Face is cover'd with Verdure; but on the other Side nothing but Precipices of burnt Rock, confuſedly piled on each other.

Southward behind this Chain, there riſes a circular Summit, terminated in Form of a Cone, which is compoſed of one vaſt Maſs of Rocks, Cinders, and barren looſe Sands. It is this which properly bears the Name of *Veſuvius*, as it from Time to Time ejects Flames, and always ſmokes.

Oppoſite to this, Northward, riſes another broken Summit, very near of equal Height, which we call the Mountain of *Somma*, either becauſe it derives its Name from a Village ſo called, ſituated at the Foot of the Mountain to the N. E. or becauſe it gives Name to that Village, whoſe fine Air and excellent Fruits render it a delightful Abode.

It muſt be allowed, that in our Language we often confound theſe two Names, and under that of *Somma*, comprehend the whole Mountain, as the Antients did (*a*) under that of *Veſuvius*.

By

(*a*) It is not impoſſible by this Rule, but that the Antients gave the general Name of *Veſuvius* to the *Volcanos* in the Neighbourhood of *Puzzoli*; at leaſt in following this Suppoſition the Commentators on

Lucre-

By this ſhort Deſcription we may ſee that the lower Part of *Veſuvius* forms a Kind of Pedeſtal for the two ſuperior Summits, or Baſis from whence they take their ſeparate Riſe, ſo as to appear two Mountains joined together to a certain Height, and then divided from each other.

Such is the preſent Form of our *Volcano*; but it is not certain it has always had the ſame Aſpect. To prove this we need only conſider the great Alterations it has undergone even in the laſt Century.

Nor

Lucretius would be able to clear up the Difficulty in theſe two famous Lines of that Poet, lib. vi.

> *Qualis apud Cumas locus eſt, montemq;* Veſevum,
> *Oppleti calidis ubi fumant fontibus auctus.*

and this Conjecture is ſupported by a Paſſage of *Diodorus Siculus* lib. iv. wherein he calls the Territory of *Cuma* by the Name of the *Campus Phlegreus*, becauſe the *Volcano Veſuvius* lay in the ſame Diſtrict. Indeed *Camillus Pelegrinus* throws all the Obſcurity on the Word *Phlegreus*, which he pretends *Diodorus* uſes in general to ſignify any Place waſted by Fire. But *Plutarch* in his Treatiſe *de Oraculis*, puts this Matter beyond Doubt, for, ſpeaking of the Calamities occaſion'd a little before his Time by the Eruption of *Veſuvius*, he places *Cuma* and *Puzzoli* amongſt the Places that ſuffer'd, as if the *Volcano* had been in their Neighbourhood, and not near *Herculanium* or *Pompeii*.

Nor is it enough to ſay, that *Veſuvius* has been chang'd by Time. Let us rather endeavour to trace from Antiquity its firſt Figure, that we may the better judge of the progreſſive Mutations it has undergone.

It appears then, that the Disjunction we behold at preſent between its two Summits is a new Thing, ſince the antient Writers all deſcribe our Mountain as of one Pyramidal Form. *Strabo* (a) tells us, *Veſuvius is on all Sides ſurrounded with a fertile Country, the Summit excepted.* *Dion* expreſſes this in a clearer Manner (b) *Originally,* ſays he, *Veſuvius was of an equal Height on all Sides, when it threw out Flames only at its Summit, in which Part yet it diſcovers the Activity of its ſubterraneous Fire, the reſt of its Compaſs being whole and entire. Hence it comes, that having yet ſuffer'd no Damage, the Borders of its higheſt Circuit preſerve their equal Appearance, while the Centre or Summit is* de-

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(a) Lib. v. p. 378.
(b) *Dion Hal. in Tito.*

decreaſed by the Force of ſucceeding Eruptions, and this produces a Cavity or Gulph in ſuch a Manner, that the whole Mountain, if we may compare great Things with ſmall, nearly reſembles the Form of an Amphitheatre.

The *Lavangi*, or Torrents of liquify'd Matter, which our Volcano throws out in its violent Eruptions, furniſh a new Proof for this Opinion, for we find the Remains of theſe in Places where they could never have run, if *Veſuvius* had not been at that Time one undivided Mountain.

A late Inſtance ſufficiently confirms this Sentiment: The *Dominican* Fathers, a few Years ago, having Occaſion to dig a Well in their Convent of *Notre Dame de l'Arc*, the Workmen at the Depth of thirty Feet, diſcover'd the Veſtigia of an old Torrent; continuing to dig they were ſtopp'd again by a ſecond, and then a third, and in ſhort, in leſs than an hundred Foot they found four Strata, all reſembling the petrify'd Torrents which are daily to be ſeen near the ſouthern Declivities of the Mountain.

Now, whoever conſiders the Situation of this Monaſtery, will ſoon perceive that theſe fiery Currents could never have taken this Courſe, if at the Time of their Deſcent the Volcano had not conſiſted of one Point, equally or gradually declining on all Sides; for had it then been of the ſame Form it is at preſent, the fiery Torrent muſt have taken a different Courſe, by following the Deſcent of the Mountain to the N. or E. inſtead of riſing ſome hundred Feet to overflow the Hills which lie betwixt them and the Place where the Convent is now built.

Dion's Compariſon of our *Volcano* to an Amphitheatre ſtill corroborates this Opinion, (*c*) as according to him the upper Circle of *Veſuvius* was entire, and only the Summit had as yet been alter'd by its Conflagrations, ſo that it follows from his Deſcription, that the Cavity cauſed by the Eruption repreſented the Area of this vaſt Am-

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(*c*) *Dion in Tito. loc. citat.*

Amphitheatre, of which the Borders compoſed the Circle; a Picture widely different from the Form it exhibits in its preſent State.

The Obſervation of *Dion* ſhews us plainly, that Part of the Amphitheatre he deſcribes, yet remains viſible towards the Northern Point of *Veſuvius*, call'd the Mount of *Somma*, whoſe internal Face, ſteep and broken, ſurrounds a great Part of the *Volcano*, and by its burnt Aſpect evidences the Fire that was formerly lodg'd in its Compaſs, preſenting no Objects to the View but looſe Stones, and rocky Maſſes of the Colour of burnt Iron, ſuch as diſtinguiſh the Mouth of the new *Volcano*; ſo that we have ſufficient Grounds to ſupport our Conjecture as to the antient State of the Mountain.

Then indeed, as well as now, *Veſuvius* roſe in a Country free from other Mountains, which gave ſome Authors a Notion that it was itſelf totally the Production of ſubterraneous Fires, and rais'd by Degrees to its preſent Height, ſo that it did not exiſt from the Creation (*d*) of the World.

But to reduce our Enquiry to cloſer Bounds, we may conjecture, that antiently the Limits of *Veſuvius* were more contracted than at preſent. No doubt they have been conſiderably augmented by the continual Addition of Rocks, Stones, and Aſhes, that from Time to Time have been ejected by its Eruptions, as well as the liquify'd fiery Subſtance thrown out, which hardening in the Air, have petrify'd to a rocky Conſiſtence.

Theſe progreſſive Diſcharges of its internal Subſtance, as well as the Shocks attending them, have undoubtedly ſwell'd the Mountain to its preſent Size. Whoever will dig near the Foot of it, particularly to the South, will ſee the Truth of this; for on ſuch Occaſions you always meet three or four thick Strata of burnt petrify'd Matter, mix'd with the Earth to a

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(*d*) *Vid. Camillo Pellegrini, Diſcorſi ſupra la Campania* ii. p. 314. and *Scotti Itinerar. Italic.* part. 3.

very conſiderable Depth. Hence it proceeds that the Sides or Deſcent of *Veſuvius* are much more eaſy and gentle than formerly, as appears from the View of the North Side, which is much the ſteepeſt, becauſe it has undergone the leaſt Alteration, at leaſt for a thouſand Years paſt, ſince the Diviſion of its Summit into two Points.

This ſhews us that the antient Height of the Mountain lies in Mount *Somma*, which is the broken Remainder of its original Top; and this Point once aſcertain'd, puts what we have advanc'd beyond Diſpute, *viz.* That the interior Circle of Mount *Somma*, whoſe Concavity is full of burnt rocky Precipices, is a Part of that entire Circle, which in *Dion*'s Time reſembled a vaſt Amphitheatre.

Having thus in general calculated the Baſe and Height of *Veſuvius*, we may eaſily conceive not only the Extent of its Circuit, but alſo that of its Summit.

In the Time of *Strabo* its Top ſeem'd flat, which may be probably im-

imputed to ſome preceding Eruption that had broke its Point. When *Dion* wrote, by the Force of new Inflammations, the Superficies of its Summit had grown concave, while its Sides continued entire, by which Means the whole took an amphitheatric Form, ſuch as at preſent we ſee in the *Solfatara* of *Puzzoli*, and other neighbouring Hills, which by the ſame Cauſe have been reduced to that Shape (*e*).

From the Time of *Dion* our *Volcano* has felt a much more ſurprizing Change. The Violence of its Conflagrations, Earthquakes, and all the other terrible Effects of its Eruptions, have entirely waſted the South and Weſt Sides, and only ſpared the Extremities of its Circle to the North and Eaſt. This Ruin and Devaſtation has extended to the Place or Hollow that ſeparates the preſent *Veſuvius* from the Mount of *Somma*, by which the Face of the Mountain took entirely a new Aſpect, tho' the Conjecture

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(*e*) *Vid. Camillo Pellegrini loc. citat. cap.* 17, 18, and 19, as well as his Map of *Campania*.

ture is only probable, either becauſe the Authors cotemporary with this Change have been ſilent, or their Works loſt by Time itſelf.

To conclude, juſt as Rivers ſwell'd by Inundations in ſome Places tear off Fragments of their Banks, and in others make Additions to their Shores by the Maſſes they violently bear along their Torrent; ſo the Conflagrations of *Veſuvius* which have ruin'd ſo great a Part of its antient Form, have alſo by Degrees rais'd a new Mountain on the former Level or Cavity, and by that Means form'd two Points on the ſame Baſis.

By this new Mountain, we mean the Southernmoſt Point, which is now the *Volcano* by the Name of *Veſuvius*, or *the Fiery Mountain*, which, in Proceſs of Time, has rivall'd its elder Siſter the Northern Point or Mount of *Somma*, as we have obſerved before.

That this new Mountain is the Production of ſucceſſive Conflagrations, and form'd by a Collection of Rocks, Cinders, and other burnt Materials caſt out of the Bowels of the common Baſis, we may judge from its conical Form, reſembling a Mole-hill newly thrown up, or a Heap of Corn, Sand, or ſuch dry homogeneous Particles, which is made by letting them fall in a perpendicular Direction.

In this Manner it is probable *Veſuvius* has acquired its preſent Form. The interior Agitation ſwell'd the Earth, the Cinders, Stones, and other Maſſes ejected into the Air, falling equally on the Sides, increaſed its Bulk, and at length the Pyramid roſe to the Dimenſions it now appears in.

Pellegrini however is of a different Sentiment (*f*). He thinks that the external Cruſt or Surface of *Veſuvius*, is a Part of the antient Maſs, and concludes that the Earth which formerly adher'd to it was torn off by the Violence of the Accenſions, and conſely that the preſent *Veſuvius*, or the inflamed Summit, is the ſame that exiſted in the Time of *Dion*.

Perhaps

(*f*) *Vid. loc. ante citat.*

Perhaps this Conjecture is true; ours may be as true. We own it difficult in the extraordinary Phenomena of Nature, ſuch as the Effects of Fire, to decide certainly, unleſs where Hiſtory or experimental Knowledge guides us to a Concluſion.

It is ſufficient we have proved that *Veſuvius* is not in Appearance, the ſame it was antiently, when it was one uniform and undivided Maſs, from Top to Bottom, whence we may ſafely conclude, that its Southern Point was the Effect of the repeated Eruptions it has been ſubject to.

We have already premis'd ſomething about the Nature of ſubterraneous Fire, and its Manner in which it is produced, whence the Reader will eaſily conceive it is a difficult Thing to fix the Æra of the firſt Eruptions of *Veſuvius*.

If the igneous Matter is either generated or increaſed by internal Mutations in the ſubterraneous Caverns of the Earth, a *Volcano* may ſuddenly break out in a Place where it is leaſt ſuſpected, as by the ſame Rule an antient *Volcano* may as unexpectedly extinguiſh for want of proper Fuel. Natural Hiſtory affords us Examples of each Kind.

It is unneceſſary therefore to enquire, if *Veſuvius* has continued burning from the Beginning of the World; or granting what is probable, that it has not, it is needleſs to ask when its firſt Inflammation began.

One Thing certain is, that long before *Strabo*, who liv'd in the Reigns of *Auguſtus* and *Tiberius Cæſar*, by the Teſtimony of that Author, *Veſuvius* had felt the Force of ſubterraneous Fires; (*g*) and this is confirmed by *Vitruvius*, a Writer of the ſame Age. (*h*) *Tacitus* alſo ſeems to pay ſome Regard to an antient Tradition, (*i*) with reſpect to the Eruptions of *Veſu-*

(*g*) *Ut conjecturam facere poſſis iſta loca quondam arſiſſe, et crateras ignis habuiſſe. Strabo*, lib. v. p. 379.

(*h*) *Non minus etiam memoratur antiquitus creviſſe ardores, et abundaviſſe ſub* Veſuvio *monte, et inde evomuiſſe circa agros flammam. Vitruv*. lib. ii. cap. 6.

(*i*) *Jam vero Italia novis cladibus, vel poſt longam ſeculorum ſeriem repetitis, afflicta. Hauſtæ aut obrutæ urbes,* *Veſuvius*, even in the early Ages of the World.

We have Reaſon to believe from the Silence of *Strabo*, that theſe early Eruptions were long before his Time; for it is not likely their Memory ſhould be loſt to us, if it was recent in his Days, or that a Writer, who ſo exactly deſcribes the remoteſt Countries, which he had leſs Acceſs to know, ſhould neglect to give us an Account of the Phenomena of a Place ſo near him as our *Veſuvius*.

From this Failure in *Strabo*, as well as the Silence of *Pliny* the Hiſtorian, who, in mentioning *Veſuvius*, has not the leaſt Syllable of its being a *Volcano*, (*k*) ſome have inferr'd, that its firſt Eruptions were weak, and conſequently not much obſerved, otherwiſe the Memory of them had been better preſerved, and of longer Duration.

We

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urbes, fæcundiſſima Campaniæ ore, et urbs incendiis vaſtata. *Tacit hiſtoriar.* lib. i.

(*k*) *Plin.* lib. iii. cap. 9. and lib. xiv. cap. 4. and the ſame Author, lib. ii. cap. 109, where he ſpeaks of Volcanos never once mentions *Veſuvius*, which is yet a ſtronger Proof.

We ſhall not enter into the Diſcuſſion of this Queſtion. It is poſſible theſe firſt Eruptions were but ſlight, and ſo not much regarded; or it might have happen'd that tho' violent, yet by a long Ceſſation, they became buried in Oblivion. At the Beginning of the 16th Century *Ætna* had continued ſo long without any Conflagration, that the Inhabitants of *Catanea*, as *Carrera* informs us, (*l*) look'd on the Accounts of its former Eruptions as fabulous. And many *Sicilians* were of the ſame Opinion, till undeceived by the Inflammation in 1536, becauſe the Mountain had for ſo long a Tract of Time diſcontinued its Rage, and given no Marks of the Fires it conceal'd in its Boſom. (*m*)

But not to inſiſt on theſe Particulars, which we leave to the Judgment of our Readers, we aſſert from the Authorities already quoted, that before the Age of *Auguſtus* our Volcano had been ſubject to Inflammations.

But

(*l*) *Carrera deſcript. Ætnæ mont.* lib iii. cap. 7.
(*m*) *Vid. Antonii Philothæi Topograph. mont Ætnæ.*

But we muſt not from thence believe what *Morery* advances, (*n*) who pretends, that when that Prince had ſeiz'd the Reins of Government, *Veſuvius* had ſignaliz'd itſelf by fiery Eruptions. The Story of an old Conflagration, as related by the falſe *Beroſus* of *Annius* of *Viterbo*, deſerves as little Credit. *Morery* will find in no antient Author the leaſt Shadow to Countenance his Opinion.

Let us now keep cloſe to the Truth. The firſt memorable Eruption, of which we have any diſtinct Account is that which happened in the Reign of *Titus*, *A. D.* 79. (*o*) Of this *Pliny* the Younger, whoſe Uncle periſh'd by his Curioſity on this Occaſion, has given us a particular Relation in two Letters (*p*). *Dion* in his Life of *Titus*, as well as the Hiſtorians of that Age, mention it; and the Poets ſpeak of it in a very expreſſive Manner (*q*). It

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(*n*) *Vid. Dictionnaire de Morery mot de* Veſuve.

(*o*) *Vid.* the Calculation of *Tillemont* in his Life of *Titus*, note 4.

(*p*) *Epiſt. Plin.* lib. 6, ep. 6 & 20.

(*q*) *Vid. Statius. Martial*, &c.

It is highly probable that on this Occaſion the Face of *Veſuvius* underwent ſome remarkable Change.

Since that Time to the preſent there have happened ſeveral ſucceſſive Eruptions, of which modern Authors have given us a Detail. (*r*) If there be ſome little Variation in their Accounts, it is becauſe ſome have placed in their Catalogue, Eruptions of little Note, which others have neglected to particularize.

As to the reſt, theſe ſucceſſive Conflagrations have been quite uncertain as to their Seaſons, Intervals, Violence, and Duration, all which have been regulated by the Caprice of Nature. We ſhall only obſerve that the Eruption in 1631 was one of the moſt dreadful ever happened, and has left behind it Marks of its Fury, which are viſible to the preſent Age. The red hot Stones, and other fiery Subſtances which it threw out on this Occaſion, burnt up Trees, deſtroy'd all the neighbouring Villages, and ſet the

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(*r*) Amongſt others *P. Julio Cæſar Recupito.*

Country in a Flame. Seven Villages were entirely ruin'd by the Torrent of liquify'd Fire, and near ten thouſand Perſons periſh'd either by the Aſhes or the Flames (*s*). Since that Time the Inflammations have been more frequent, but in Return they have been much leſs violent and deſtructive.

However, the Eruption of 1730 deſerves our Notice, not on Account of its Fury, but becauſe it made a ſenſible Alteration in the Summit of the *Volcano*, for a great Quantity of combuſtible and liquid Matter, ſettling near the Mouth of the *Volcano*, rendered the Top much higher and more pointed than it was before.

Another Particularity remarkable in the ſame Eruption was, that the Flames were much brighter and livelier than uſual, and roſe into the Air to a prodigious Height. The fiery Torrent which deſcended on the Slope of the Mountain, made no great Progreſs,

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(*s*) According to the Calculation of *Caraffa de Conſtagr. Veſuvian.* but *P. Recupito* reduces the Loſs to 5000.

greſs, but on the Side, where the ſouthern Borders of the *Volcano*, were ſhelter'd by the rocky Circuit of Mount *Somma*, a horrid Inundation of Fire covered all the Bottom of the Plain, which we call the Valley of *Atria*.

The chief Damage ſuſtained aroſe from the burning Cinders, that ſet Fire to a large Wood in the Diſtrict of *Ottajano*, which would have been entirely conſumed, if, by cutting down the Trees that lay in the Way, a Stop had not been put to the Progreſs of the Flames.

CHAP. I.

A Journal of the great Eruption of Veſuvius *in* 1737.

EVER ſince the Eruption of 1730 to 1737, the antient Baſin of *Veſuvius* has conſtantly emitted Smoke, often intermingled with Flames, ſo that every Day gave new Tokens of the Conflagration ſpreading within, and ſeemed to warn us of an approaching Eruption. Theſe Marks or Symptoms for three or four Months preceeding the Event, became ſtill more violent. An unintermitted Smoke with bright Flames daily increas'd. This is no new Object to our People. A long Series of Years has made it familiar, and the Vulgar are ſo far from being alarmed at it, that they look on it as a favourable Sign, believing that the better theſe ſubterraneous Fires vent themſelves, they have leſs Cauſe to apprehend violent Eruptions or Earthquakes, which many imagine to proceed from one and the ſame Cauſe.

Whatever Truth there is in this popular Notion, with reſpect to the Danger of Eruptions, our laſt convinced us it is not to be depended on, for towards the End of *April* and Beginning of *May* 1737, even when the Volcano diſcharged itſelf in Clouds of Smoke, the Conflagration began.

On the 14th and 15th of *May* the Flames and Smoke increas'd to that Degree, that on the Night of the 15th the Volcano threw out red-hot Stones, at the ſame Time a Torrent of liquify'd Matter, deſcending from the Mouth, ſeemed to threaten *Boſco*, a Village ſituated at the Foot of the Mountain to the Eaſt.

On the 17th and 18th of the ſame Month the Flames increaſed violently, and the Smoke augmented in Proportion; and what gave new Force to the

Inflammation was, that the Cavity of the Volcano was at that Time almoſt cover'd with Sulphur, which had been incruſted there for a long Tract of Time.

Sunday, *May* 19, the Conflagration ſpread with new Rage. The thick and black Smoke that iſſued, form'd Clouds of Darkneſs that cover'd the Air, and by the Force of the Flames were carried to a ſurprizing Height. The Mountain made a roaring Noiſe which was echo'd from the Hills adjacent. Then firſt a general Panic appear'd in every Face, and the Terror of the People hourly increaſed at ſo dreadful a Spectacle. Such it really was, to behold through ſo gloomy a Smoke a prodigious Quantity of Stones and rocky Subſtances red-hot hurl'd in the Air to an amazing Height, and falling down with incredible Noiſe along the Sides of the Mountain. This terrible Scene continued till the next Day, the Eruption ſtill gaining new Strength.

On *Monday*, *May* 20, at Eight in the Morning, the Storm of burning

Stones and Cinders became more furious than ever, and the Inflammation roſe to that Degree, that in Spite of the Sun the Flames were viſibly obſerv'd thro' the Smoke of the Volcano, as bright as Rockets in a dark Night.

Towards the Evening the Tempeſt grew more outrageous, and was attended with an Inundation of burnt Stones, Pumice, and Aſhes. The Smoke chang'd its dark Colour to a clear brown, but the Circles it made in the Air were larger than ever. In the mean Time the Fire of the Summit plainly ſpread, as every Moment ſome Part of the Cavity fell into the Gulph beneath. Fill'd with Horror, and dreading the worſt, the Inhabitants of the neighbouring Villages began to retire with their Effects.

The ſame Day, about Two o'Clock, the Mountain gave a Peal aſtoniſhing beyond the loudeſt Thunder. Some attributed this to a large Rent made in the Side, the Effects of which did not appear till about Seven o'Clock the ſame Evening.

This Rent or Crack was made in the lower Part of the S. W. Side of *Veſuvius*, properly ſo call'd. The firſt Thing obſervable was, that it flam'd violently even when the Top of the Volcano ſeem'd itſelf inflam'd the moſt, and as the Smoke of the upper Part now receiv'd a new additional Supply, ſo it had certainly obſcured all the W. Coaſt of *Naples*, if the briſk ſouthernly Winds had not ſtopp'd its Progreſs, and diſſipated it in the Air.

During this Time the Noiſe of the Volcano was no leſs horrible than uninterrupted. About 8h. 22m. the Mountain was all cover'd with a thick Cloud, thro' which every Moment the Flames darted like Lightening. They are indeed a Sort of Lightening which are peculiar to our Volcano in its Eruptions, and much reſemble the Rockets us'd in Fireworks.

Soon after a fiery Torrent appear'd from this new Opening, taking its Courſe along the Deſcent with a viſible Rapidity towards the Village of *Reſina*; but about 9h. 25m. it ſeemed to deaden in its Progreſs, and loſe its fiery Aſpect. Juſt the ſame Thing happen'd to another Stream of the ſame Sort, that iſſuing from the Mouth of the Volcano bent its Way towards *Boſco*. Many from hence concluded theſe *Lavangi* were in Reality extinguiſh'd, and that there was no more to fear.

In the mean Time all the Symptoms of the Eruption, ſuch as the Smoke, Flames, Stones, &c. continued ſtrong as ever, the Noiſe no way decreaſed, and the Air ſeem'd tormented with unabated Fury.

Thus Matters continued till 11$^{h.}$ 22$^{m.}$ at Night, when the new Aperture broke out afreſh, with a Storm more violent than before, even throwing out Stones of a large Size, which it had not done hitherto ſince the firſt Eruption. At the ſame Time the fiery Torrent iſſuing from it, renew'd its Courſe with greater Impetuoſity. The whole Mountain ſeem'd on Fire, both on Account of the Flames, and their Reverberation from the Darkneſs

neſs with which they were by the Smoke ſurrounded. In one Moment the whole Mountain gave a Crack as if it was falling into Ruin; and this Noiſe continued ſome Moments without Intermiſſion. The Earthquakes that accompanied it were as violent as frequent, ſo that all who had as yet the Courage to ſtay in their Houſes, were now obliged to quit them. Nothing could be ſeen but Crowds of People flying on all Sides for a Place of Safety.

Immediately after, the Torrent of Fire fill'd up a great Part of that Flat call'd the *Terra-plana*, which lies oppoſite to the new Aperture, and which we have deſcribed as the Baſis of *Veſuvius*, making an Inundation of about 500 Foot in Length, and 300 in Breadth, where it ſettled from 11$^{h.}$ 22$^{m.}$ the Night of the 20th till Three o'Clock in the Morning on the 21ſt.

Scarce had the next Day, *May* 27, begun, or about Half an Hour after One that Morning, when the *Lavangi* or Torrent that had iſſued from the

Summit extending towards *Boſco* appeared totally extinct. A ſecond Stream from the ſame Source ſtill crept to the Weſtward, but very ſlowly. The laſt, which iſſu'd from the new Breach, and which without Diſpute was the largeſt, after forming a Lake in the Bottom, as we obſerved, being continually puſh'd forward by new Supplies, fell into the adjacent Vallies, dividing itſelf into ſeveral Branches, according to the Situation of the Grounds it paſs'd thro'.

The firſt of theſe Branches took its Way towards *Reſina*, but by the Way broke into a Valley where ſeveral improv'd Grounds, planted with Trees, were the Prey of its conſuming Heat. In the Eruption of 1698, which alſo fell out in *May*, this ſame Valley met with the like Fate.

It appear'd that the firſt Branch was the moſt conſiderable of all, its Front extending near 30 Foot in Breadth. It ſtopp'd at length, but had it continued its Progreſs in the ſame Direction, it had probably fallen on the *Greek*

Tower, by the Convent of the *Capuchins*.

From the Extremity of this Branch, a fiery Rivulet detach'd itſelf, which, tho' inconſiderable, did ſome Damage in the low Grounds adjacent.

The Violence of another Branch of this Torrent was more conſiderable. It penetrated into a Valley, thro' which it made its Way in a Body to a Place call'd the *White Ditch* [*Foſſa bianco*] where ſpreading into two Arms, that on the Right ruin'd ſome Fields, the Left made little Progreſs, and did no great Miſchief. This *White Ditch* had been infeſted before with a Torrent from *Veſuvius* in the Eruption of *September*, 1696.

Notwithſtanding this ſecond Branch of the Torrent from the Aperture ſeem'd thus ſtopp'd, yet on *Tueſday May* 22 it reſum'd its Courſe, not by either of the Arms before-mention'd, but by an intermediate Channel, falling firſt into ſome Vineyards, where it form'd a Kind of burning Lake. Yet, tho' this ſeem'd to exhauſt a great Part of the fiery liquify'd Matter, yet it ſtill continued its Courſe wards, till, after deſtroying ſome Country Seats, it fell towards the Weſt Side of the *Greek Tower*. Here it deſtroy'd a Bridge which had been erected to carry on the King's Road over a narrow Valley about twenty-five Foot deep, between the Chapel of Purgatory, and the *Carmelite* Monaſtery; and having croſs'd this Valley, it proceeded towards the Sea. In *May* 1698 another *Lavangi* had taken the ſame Route, but was ſtopp'd before it could reach the Bridge; obſtructed however by the Bridge on the one Hand, and the Wall of the *Carmelite* Garden on the other, it made its Way to the Right and Left, into the Highway, where it ran ſixty ſeven Feet to the Eaſt. At the ſame Time it broke into the Chapel of Purgatory, where it's very Exhalations conſumed all the ſacred Ornaments.

On the other Hand, towards the *Greek Tower* and the *Carmelites* Convent, it ſtretch'd ſeventy-five Feet;

a little Door which lay at it's Side, being burnt by the Fire, gave it Admiſſion into the Church, where it made little Way, but the main Body of the Torrent ſurmounting all Obſtacles, extended itſelf in the Valley, keeping its Courſe to the Sea, except that as it paſſed by the Convent, a ſmall Branch of it broke into the Refectory and Sacriſty, both by the Windows and Doors. It wanted little to have reach'd the Height of the Cells, for the Place was ſo narrow, that it could not paſs without ſwelling to a great Height.

Theſe two Diviſions of the ſecond Branch, thus falling into the Highway, were about twenty-three Foot each in Front, and took ſix Hours to compleat their Courſe, *i. e.* from Seven o'Clock on *Tueſday* Morning to ſome Minutes after one the ſame Day.

Another Rivulet exhauſted its Fury on ſome inclos'd Grounds, where it ſtopp'd. All the reſt were done at half an Hour paſt One, except a ſmall Branch, which bending ſlowly towards the Shore, determin'd its Courſe at Four in the Afternoon. Du-

During all this Time, till *May* 23, the Summit of *Veſuvius* ejected violent Flames, accompany'd with Showers of burnt Stones and Cinders. On the 24th, after a long Exploſion of Lightenings, uſual on theſe Occaſions, the Fire at Top ſeemed to abate a little of its Rage, but the Smoke and Aſhes ſtill continued to be ejected as before.

The 27th the Flames ſenſibly ſubſided, tho' the Smoke was whirl'd out with as much Impetuoſity and as high as ever, but its Blackneſs was conſiderably lighten'd and decreaſed.

On the 28th the Fire of the Summit was reduced almoſt to nothing; and on the 29th and following Days, totally diſappear'd.

May 30 and 31, and from the 1ſt to the 5th of *June*, there ſtill iſſued a great Quantity of Smoke, but of a pale and whitiſh Colour.

June 5 and 6, there fell a great deal of Rain which occaſion'd the *Lavangi*, or fiery Torrent extinct, to exhale a great Smoke, ſo thick as to prevent the diſtinguiſhing of Objects near them. That eſpecially near the *Greek Tower* caſt a ſtrong ſulphureous Smell, which had never been obſerved there while it continu'd its Courſe. This noxious Vapour infected the Ground for about ſix hundred Foot in Circumference, withering the Leaves of the Trees, and blaſting the young Fruits.

After ſome Days Interval, a ſecond Rain occaſion'd the Torrent to ſmoke as before; but this new Exhalation had no ſulphureous Odour, but one much more offenſive to the Noſe, and more pejudicial to the Head. It was the more remarkable as it had no Reſemblance with any Smells we know, and it continued to be felt in that Place for a long Time after.

As to the Fire of the Torrent, it preſerved its Fierceneſs outwardly till *May* 25, when, the Surface being expoſed to the Air, began to cool, the Heat retiring to the Heart of the *Lavangi*, where it continued about a Month ſo intenſe, that when it was open'd half a Foot and a Stick introduced thro' the Aperture, it took Fire inſtantly.

It now remains we give the neceſſary Reflections on the Courſe of this Eruption, which ſhall be founded either on our own Obſervations, or the beſt Accounts we could procure from others relating to the Subject.

I. The State of the Air during all the Month of *May*, till the 8th of *June*, was as we have repreſented in the Table annexed, for the Underſtanding which, 'tis proper to take Notice;

1. That the Obſervation was often made two or three Times at different Hours of the ſame Day.

2. That the different Degrees of Wind are deſign'd by the Numbers 0. 1. 2. 3. 4.

3, That the Meaſure of the Barometer is taken by Inches, each of which, for the greater Exactneſs, is ſubivided into ten Parts.

4. That the Thermometer we us'd, is of the Invention of Mr *Hawksbee*, [*FRS*] in which the greateſt Degree of Cold is mark'd with 100 Degrees, and the Extremity of Heat with 0.

5. That the Meaſures for Rain are ſuch as require four of them to expreſs the Rain fallen to, the Height of the *Line*, which Line makes the fifth Part of an Inch *Neapolitan* Meaſure.

We have not only given a general State of the Air during the Courſe of the Eruption, till its entire Concluſion or Period, but alſo for ſome Days before its Commencement, and that for two Reaſons.

It is on theſe Occaſions highly agreeable, nay, it is of the laſt Importance to have before us a Table which ſhews us at one View the Face of Nature, and her Effects, by which we may judge what Connection there is between them, or if they are entirely independent on each other. By this an Enquiry into the Works of that myſterious Goddeſs will become more eaſy, our Notions will be clearer on this Subject, and our Judgment better grounded.

We ought moreover to pay ſome Regard to the Antients, who were of Opinion, that the Winds had a great

Share in the Eruption of *Volcanos*. *By the help of Obſervations* (ſays *Strabo*) *we have Ground to believe the Winds foment theſe fiery Exhalations that iſſue from the* Æolian *Iſles* (*a*) *and the Boſom of* Ætna, *and that as the Winds abate, the Fury of theſe Inflammations abate alſo* (*b*). And in another Place he tells us from *Polybius*, *that the Fires of the* Æolian *Iſles, are uncertain in their Violence and Duration.* He adds, *That by the Nature of the Shock, and the Manner of the firſt Eruptions, it is eaſy to gueſs what Winds will blow in three Days, ſo that when Ships lye Wind-bound there, it is uſual for ſome* Liparots, *expert this Way, to foretell when the Voyage will prove favourable.*

Whatever Foundation there be for this old Notion, and ſome others of the ſame Kind, quoted by the antient Authors, we ſee no Reaſons ſufficiently clear to determine us to believe that the Winds or the Weather have any great

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(*a*) Now *Lipari*.
(*b*) *Strabo*, Lib. vi. p. 423.

great Influence on the Eruptions of our Mountain, much leſs to imagine, that from the Nature of the Winds, any certain Judgment can be form'd as to an approaching Conflagration, or to predict from the Eruption itſelf, what Winds ſhall ſucceed in a few Days.

Indeed by the Courſe of the Winds the Clouds of Smoke and Aſhes, uſual on theſe Occaſions, may be impell'd rather to one Side than the other. The Noiſe of the Flames, or of the internal Gulph, where the Liquefaction is made, may alſo vary from the ſame Cauſe, and exert itſelf in a louder or ſofter Manner, But this is all, that we can aſcribe to the Winds with any Certainty. Nor can we fix any ſettled Phenomenon, that is the Fore-runner of the Wrath of our *Volcano.* Its Eruptions obey the ſecret Orders of Nature, and appear without any Warning of their fatal Purpoſe.

We are not ignorant that ſome People lay down chimerical Rules, whereby to judge of the approaching Danger, ſuch as a ſtrong Smell of Sulphur in the Neighbourhood of the Mountain, a ſharp and ſulphureous Taſte that at theſe Times infects the Springs that take their Source from thence; but as we know that thoſe Phenomena have appear'd without any ſucceeding Eruption, and that Eruptions have happen'd without any ſuch preceding Token, ſo we think no Streſs can be laid upon them as to the Caſe in Queſtion.

Upon the Report of the Peaſants, who frequent the Mountain, another Prognoſtic has been advanced. It ſeems ſome Days after the ſlight Earthquake in *March* 1737, and a few Days before the Eruption (*c*), theſe Country Fellows, while they were cutting Wood, heard a tumultuous growling Noiſe beneath the Earth, which in their Style, they compar'd to the grunting of a Herd of Swine when they run together, and are forced thro' ſome narrow Paſſage. The poor ſimple Men were ſo frighten'd, that they left their Work, and ran home in a great Alarm.

(*c*) It was on the 17th of *May* about Sun-ſet.

We don't pretend to warrant the Truth of this Story: We know how eaſily the Vulgar are deceived with the leaſt Illuſion, how readily they catch the Panic, and how credulous they are with reſpect to Things extravagant or marvellous, eſpecially in Times of publick Calamity and Fear. The printed Relations we have of the Eruption in 1631, ſhew us that ſuch is the Genius of the common People in all Ages. *(d)* *Pliny* the younger ſpeaking of the Eruption which happen'd in his Time, has not omitted the prodigious Apparitions that terrify'd the Vulgar, as one of the Prognoſtics of that deſtructive Event, *(e)* and *Dion* in his Account of it, talks in the ſame Strain. (*f*)

If it be uncertain to propheſy our Erup-

(*d*) *Juliani Incendio di* Veſuve, 1631.

(*e*) *Nec defuerunt, qui fictis mentitiſque terroribus, vera pericula augerent.—Plerique lymphati terrificis vaticinationibus & ſua & aliena mala ludificabantur.* Plin. Lib. vi. Ep. 20.

(*f*) *Magnus numerus hominum inuſitatâ magnitudine, quales Gygantes finguntur, in eodem Monte regi oneque finitima, ac proximis Civitatibus interdiu, noctuque vagari, verſarique in aëre viſus eſt.* Dion *in* Tito.

Eruptions from Preſages of this Kind, we can much leſs judge of their Violence by the Quantity of Smoke, which, riſing in a perpendicular Line, often repreſents in the Air the Figure of a Pine Tree. This is a *Phenomenon* which will always happen when the Quantity of Smoke emitted is copious, and meets with a ſerene and calm Air. *Pliny* accounts for this in a juſt and philoſophical Manner. (*g*)

One Thing, the moſt remarkable in the Height of our laſt Eruption, was the thundering Noiſe heard from the Boſom of the Volcano, eſpecially on *Monday May* 21, at which Time, not only the ſtrongeſt Edifices in *Naples* felt the Shock in a ſenſible Manner, but the Effects of it extended to the Diſtance of 15 Miles or further. That this *Phenomenon* did not proceed from the ſhaking of the Mountain, or that of

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(*g*) *Nubes—Oriebatur, cujus ſimilitudinem & formam non alia res magis, quam Pinus, expreſſerit; non longiſſimo velut trunco efflata in altum quibuſdam ramis diffundebatur, credo, quia recenti ſpiritu evecta, dein ſeneſcente eo deſtituta, aut etiam pondere ſuo victa in latitudinem vaneſcebat. Plin.* Lib. vi. Ep. 16.

the adjacent Parts, is what we have Reaſon to believe from demonſtrative Proofs. To what then could it be aſcrib'd? We anſwer, to the Agitation the Air ſuſtain'd, by the ſucceſſive Torrents of Flame that iſſued from the Summit, juſt as when you throw Gunpowder on a Plate of Metal red hot, you ſee it ſparkle and crack with double Impetuoſity.

What further proves the Shock we felt to proceed from the Convulſions of the Air, is, that in the Rage of the Eruption, we obſerved from *Naples*, that the bellowing Noiſe of *Veſuvius*, and the Shock of the Houſes always happened at the ſame Moment, and that they kept a certain Interval always after the violent Spouts of Fire, we have mention'd, of which we were Eye-witneſſes. Now this Interval could never happen if the Shocks were occcaſion'd by a real Earthquake, or the ſhaking of the Mountain, for in this Caſe, the Shock muſt have extended the ſame Inſtant to diſtant Places, which is no ways probable.

The Experience of many, who had already by Obſervation diſcovered the Theory of this *Veſuvian* Roaring, and the Shock attending it, puts the Caſe beyond all Doubt. For when they perceiv'd thoſe prodigious Jets of Flame that the Volcano emitted from Time to Time, they immediately told, that in ſuch a Time, we ſhould hear the Roar, and feel the Shock, and the Truth never fail'd to anſwer their Prediction.

Beſides this Noiſe of *Veſuvius*, the Eruption preſented us another *Phenomenon*, obſerv'd in preceding Inflammations, and of which we have already taken ſome Notice. That is the Lightenings that frequently iſſued from the thick Clouds of Smoke and Aſhes, ejected by the Fury of the *Volcano*.

We could perceive no great Difference between the common Lightenings and thoſe of *Veſuvius*, unleſs that the latter were leſs violent, and their Colour paler, and the Noiſe that attended them not ſo loud.

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As we beheld them thro' the Medium of a thick and gloomy Smoke, they reſembled thoſe Lightenings that ſometimes are ſeen in the Air condenſed with Clouds, and which trace a Ray of Fire broken into Angles. Yet notwithſtanding their Paleneſs, they were very viſible from *Naples* in the Night, even by the Light of their own Reflection, of which we were convinced by ocular Demonſtration.

As to the Thunder that followed them, it differ'd from the common in this, that it conſiſted of one Clap, without either Echo or Prolongation, as happens to the former, from the Repercuſſion of Air thro' the ſinuoſity of the Clouds, or the Obſtruction of other terreſtrial Bodies. The Noiſe of our *Veſuvian* Thunder was momentaneous, like the Diſcharge of a Cannon fir'd at Sea at a ſmall Diſtance: During the Time of the Eruption, we obſerv'd nothing more ſingular on this Article. We ſhall only take Notice that *Borelli* in his Hiſtory of the famous Eruption of *Ætna* in 1669, makes not the leaſt

Mention of ſuch Lightenings, either, perhaps, becauſe that *Volcano* produced none, or becauſe its vaſt Height confounds them with the general Inflammation, and conceals them from the Obſervation of the Beholders.

Pliny the younger has been more exact, for in the Deſcription he has given us of the Eruption he was Eyewitneſs to, he has theſe Words,— *On the other hand we beheld a black Cloud, whoſe Aſpect was horrible, from the Boſom of which darted quick Vibrations of Fire, which were follow'd by Rays of Flame, nearly reſembling our common Lightening, only that they ſeemed of larger Extent.*

Before we quit this Subject, we ſhall juſt obſerve another particularity, which merits ſome Attention, that is, that theſe *Veſuvian* Lightenings were not only viſible at the Mouth of the *Volcano*, and in the thick Cloud of Smoke that cover'd it, but were alſo perceiv'd over the fiery Torrent or *Lavange*, while, impregnated with Fire, it took its Courſe along the Mountain, attended with Smoke and ſulphureous Exhalations. Indeed theſe laſt Lightenings were much fainter, and in leſs Quantity. In general they were quickeſt and ſtrongeſt at the Height of the Eruption, tho' they were ſeen to the laſt, even when its Rage was on the Point of Expiration.

Several Hiſtorians, who have left us an Account of the former Eruptions of *Veſuvius*, ſpeak of the extraordinary ebbing of the Sea, if not in all its Conflagrations, at leaſt in the moſt remarkable. They deſcribe the Shores left dry, the Veſſels and Fiſh deſerted by the Waves for ſome Diſtance from the Land. This *Phenomenon* is atteſted by the cotemporary Authors who have related the Eruption in the Reign of *Titus*, as well as that in 1631.

Be that as it will, or whatever be the Cauſe of ſo remarkable a *Phenomenon*; in the Eruption we relate, nothing of this Kind happen'd, the Sea preſerving its uſual Appearance. This perhaps may afford us a Proof of what is certainly Fact, viz. that our laſt Conflagration of 1737, was not ſo violent in its Effects as ſome preceding ones, eſpecially thoſe two dreadful Eruptions of *Titus* and 1631, before-mention'd.

Both Tradition and the Teſtimony of Authors record the Inundation of Waters that accompany'd the Eruption of 1631. It was then imagin'd, and has been even in our Times believed, that theſe Floods of Water iſſued from the Summit and Openings of *Veſuvius*, or in other Words, that they proceeded from the ſame Channels that diſcharged the ſubterraneous Fire.

Our Naturaliſts have endeavoured to account for this *Phenomenon* very different Ways, each according to their own favourite Hypotheſis, and more ſo as the Subject was new, neither *Ætna*, nor the moſt celebrated *Volcanos*, having in their Eruptions diſcover'd any Appearance of this Kind.

But in ſpite of an Opinion ſo common and received, we are fully perſuaded that theſe Waters, ſuppos'd to proceed from the Cavities of the Mountain, are nothing but the Rain Water. Our Hiſtorians agree in one Point, that during the Eruption of 1631, it rain'd in ſo violent a manner, that the Cataracts of Heaven ſeem'd to be open'd on the Territory of *Naples.* Now this Rain finding the hollow Parts of the Mountain full of the burning Matter thrown out by the Eruption, which fill'd up the Channel it formerly occupied, of Conſequence forc'd its way into the adjacent Plains, overwhelming the Villages, and carry'd new Ruin and Deſolation all around. Beſides this, we know, in exceſſive Rains, the Earth imbibes a large Portion of it in its Boſom, and conſequently diminiſhes it's Courſe. But this was then prevented by the hot Aſhes of *Veſuvius* which cover'd all the Ground, and which by their Nature are ſo far from receiving Water, that they throw it off, juſt like the Tiles of Houſes. This we have found by repeated Experiments. Now this was a new Cauſe of the Violence of the Inundation in the Eruption 1631.

This Opinion of ours is yet confirmed by another inconteſtable Proof. By the Accounts left us of that fatal Conflagration, the Damage occaſioned by the Floods was as great in *Somma*, *St Anaſtaſia*, *Nola*, and other Diſtricts that lie to the N. of *Veſuvius*, as in the Southern Cantons to the Sea, ſuch as *Portici*, *Reſina*, the *Greek Tower*, and the *Tower* of the *Annonceada*. Now if theſe Waters had iſſued from the Mouth of our *Volcano*, together with the Flames, they could never reach thoſe Places that lie to the N. of *Veſuvius*, otherwiſe we muſt ſuppoſe them thrown up in the Air together with the Aſhes, which is a ridiculous Suppoſition to any one who knows that the two Summits of *Somma* and *Veſuvius* are divided from each other by an Interval of many hundred Feet.

To confirm this, we ſhall here quote a Decree of the collateral Council of *Naples*, which we have ſeen, and is to be found at length in *Grovani Juliani.* (*h*) It is dated *March* 12, 1632, and carries this Title (which is our laſt Proof) *Upon the Exemption from Taxes, petitioned for by certain Communities, to repair the Damage they have ſuffer'd by the Flames, Stones and Cinders of* Veſuvius, *as well as the Floods which have fallen both from the ſaid Mountain and the Mountains of* Avella.

This Edict then plainly proves that the Inundation of 1631, not only ravag'd the Plains, around the Foot of *Veſuvius*, but thoſe near the Hills of *Avella.* Now theſe Hills lie near the Roots of the *Apennines*, eight Miles diſtant from *Veſuvius*, and diſcover no Marks of ſubterraneous Fires, ſo that this Inundation was not produced by the Eruption, but would have equally happen'd if the *Volcano* had been in a State of Tranquillity.

(*h*) *Juliani Tract. de* Veſuvio & *ejus incendiis.*

CHAP.

CHAP. II.

Of the Lavangi, *or Fiery Torrent ejected by the Eruption of* Veſuvius, *and its Dimenſions and Quality.*

WE have in the preceding Chapter given the Reader a general Deſcription of the laſt Eruption. We have made an exact Journal of its Beginning, Progreſs and Period, and we now propoſe to enter into a more circumſtantial Enquiry of its *Phenomena*, and endeavour to ſatisfy the Curioſity of the Learned on ſo curious a Subject.

Amongſt the various Appearances that attend the Eruption of *Veſuvius*, the firſt Place is certainly due to thoſe fiery Streams of liquify'd Matter, which we call *Lavangi*. The exceſſive Hardneſs

neſs they contract, in loſing their Heat, leaves them to our Eyes, as eternal Monuments of the Force of that Furnace, that is able to diſſolve them, and give them ſuch a fatal Fluidity.

We don't find in the moſt antient Writers any diſtinct Account of theſe *Veſuvian Torrents*, either becauſe the *Volcano* then produced no Effects of this Kind, tho' inflam'd; Nature differing often in her Methods of Operation, or becauſe, in the Confuſion that attended theſe calamitous Events, People were not calm enough to make the proper Obſervations. They think it ſufficient to tell us that the Mountain was all in Flames, and add no more.

Some imagine that the Eruption in the Reign of *Titus*, *An. Dom.* 79, *Veſuvius* ejected a Torrent of this Kind. and to prove this, they bring the Authority of *Pliny* the younger, (*a*) (who ſays) that the Galley, on Board which his Uncle was, could by no Means gain

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(*a*) *Jam Vadum ſubitum, ruinaque montis littora obſtantia. Plin.* lib. iv. ep. 16. vid. *Tellemont dans la vie de Titus,* Art. 5.

gains the Shore, becauſe of a Cape, whoſe Point extended itſelf in the Sea, proceeding from the Ruins of the Mountain. This Conjecture is ſupported by later Examples. We know that in 1631, our fiery Torrents forced a Paſſage from the Summit of the Mountain to the Sea. The dreadful Conflagration of *Ætna* in 1669, left near the City of *Catanea*, a Monument yet more remarkable, for the Stream of Fire penetrated ſo far into the Main, as to form a Mole or Key, whoſe Harbour was capable of receiving Veſſels of good Burthen.

Two Reaſons however determine us to believe the Cape mention'd by *Pliny* was of a different Nature. 1ſt. The Uncle of this Hiſtorian left Cape *Miſeno* at the beginning of the Eruption, now it is no way probable that in ſo ſhort a Time as was neceſſary to ſail from thence to the Shore of *Naples*, that a Torrent of Fire ſhould have reach'd the Sea. Our inflam'd Current, it is well known, run too ſlowly to make ſuch a quick Progreſs, beſides, that they ſeldom begin their Courſe from the Summit, till the Mountain has exerted its Rage for ſome Days in Flames and Smoke. 2d. It is not eaſy to conceive how a Torrent of this Kind could prevent *Pliny* the elder from landing. Let us ſuppoſe it ever ſo large, its Breadth could not exceed 3 or 400 Foot, which could be no great Obſtacle to a Galley from putting aſhore in ſo open a Bay, ſince it was eaſy by ſailing either to the one hand or the other to have gain'd the Land.

Let us conclude then that the Obſtacle which *Pliny* the younger points out, proceeded from the Aſhes, Pumice Stones and Fragments thrown out of the *Volcano*, which falling near the Shore, made the Water too ſhallow for a Veſſel to get Depth ſufficient to float. We may gueſs at the prodigious Quantity of Matter thrown out, by what the ſame *Pliny* relates to have happen'd at *Stabia*, a Place ſituated on the oppoſite Side of the Bay, where the Inhabitants were almoſt buried in their Houſes by the Shower of Cinders that fell.

This ſufficiently ſhews that the antient Writers, have left us no Deſcription of our *Veſuvian* Torrents, perhaps for want of accurate Obſervations, tho' *Strabo* (b) and *Virgil* (c) have very plainly expreſs'd themſelves as to the Streams of the ſame Kind iſſued by Mount *Ætna.*

For what remains: Some ſuppoſe that *Procopius* was the firſt who has diſtinctly mentioned our *Lavangi*; for ſpeaking of the other *Phenomena* that attend Eruptions of *Veſuvius*, he adds, *Beſides theſe, the Summit of this Mountain, like that of* Ætna, *ejects Quantities of inflamed fluid Matter, which roll down its Sides to the Plains, like Rivers ſwell'd with Rain,*

(b) *Lapide in crateribus colliquato, ac deinde ſurſum egeſto, humor vertici ſuperfuſus cœnum eſt nigrum per montem deorſum fluens; deinde ubi concrevit, lapis fit molaris.* *Strabo,* Lib. vi. p. 413.

(c) *Vidimus undantem ruptis fornacibus Ætnam,*
Flammarumque globos, liquefactaque volvere ſaxa.
Virgil Georg. Lib. i.
Idem Æneid III. ver. 576.

and carry Ruin and Deſtruction where-ever they go. (*d*)

Tillemont, though otherwiſe an exact Writer, gives the Merit of this Diſcovery to *Procopius*; (*e*) but we find it a Miſtake, ſince before his Time *Caſſiodorus*, in his famous Letter, in the Name of *Theoderick* K. of *Italy*, to *Fauſtus* Governor of *Campania*, ſufficiently deſcribes our Torrents, tho' the Terms he uſes are not ſo clear as thoſe of *Procopius*. (*f*)

As *Caſſiodorus* here only mentions Duſt and Sand, it has inclined ſome to think he only alluded to thoſe Showers of Aſhes that our *Volcano* never fails to eject in its violent Eruptions, and what he ſubjoins has confirmed this Miſinterpretation. (*g*) The wrong underſtanding the firſt Paſſage has created a new Error in the Judgment of our *Veſu-*

(*d*) *Pocop. de bello Gothic.* Lib. III.

(*e*) *Tillemont vie de Titus.* Art. 5.

(*f*) *Videas illic quaſi quoſdam fluvios ire pulvereos, & arenam ſterilam impetu fervente, veluti liquida fluente decurrere. Caſſiod. variar*, Lib. iv. Ep. 50.

(*g*) *Stupeas ſubito uſque ad arborum cacumina dorſa intumuiſſe Camporum*, &c.

Veſuvian Hiſtorians, for by it they have concluded that in the Eruption that happen'd in the Reign of *Theodorick*, there fell ſuch a Deluge of Aſhes as to cover the Tops of the Trees, and they take Care to bring this Prodigy to ſupport the firſt Miſtake. Hence proceed the Exaggerations of *Tillemont*, (*h*) as well as thoſe of our own Writers, eſpecially *Gioſeppe Macrino* (*i*) in his ſmall Treatiſe on *Veſuvius*.

But asking Leave of theſe Authors, we rather are of Opinion, that *Caſſiodorus* had in View our *Lavangi* or liquify'd Torrents, and that from ſeveral Terms in the Paſſages quoted: If he employs the Words Duſt and Sand, it is becauſe, that to look at our Torrents as they run by Day-light, we ſee only a confus'd Current of Duſt, Sand and Stones, more or leſs inflam'd, as they feel the Impreſſion of the external Air, as we ſhall have Occaſion to obſerve in its proper Place.

What ſtrengthens our Conjecture is, that

(*h*) *Tillemont in loc. citat.*

(*i*) *Macrino* Cap. xi.

that as on the one hand it is impoſſible to conceive a Shower of our *Veſuvian* Aſhes, ſhall be ſo great as to bury Trees in its Depth, ſo, on the other hand, Experience ſhews us our Torrents often ſwell to a Height ſufficient for that Purpoſe, ſo that there ſeems to remain no Doubt as to the Senſe and Interpretation of (*k*) *Caſſiodorus.*

'Tis certain this Interpretation of *Caſſiodorus* is very agreeable to our Hypotheſis, for it is not very credible, (tho' former Authors are ſilent) that *Veſuvius* never ejected ſuch fiery Streams, the firſt Ages. For ſince *Ætna* and the *Volcanos* of the *Liparean* Iſles, by the Confeſſion of *Strabo*, diſcharg'd ſuch

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(*k*) We ought here to obſerve the Words of *Sigonius*, Lib. xvi. *de Occidentali Imperio, An.* 512. For he there ſays the ſame thing as *Caſſidorus*, but with greater Exactneſs.—His Words are— " Cinis inde tantus " effundebatur ut Provincias quoque tranſmarinas obrueret. In *Campania* verò quidam quaſi pulverei " Amnes fluebant ; & arena impetu fervente more " fluminis decurrebat, qua plana camporum uſque ad " Arborum cacumina tumeſcebant."— This Paſſage puts the Matter beyond doubt, that it was the Torrents which overwhelm'd the Trees in their Inundation.

ſuch Torrents in his Time, why ſhould not our *Veſuvius* reſemble them in this Point as well as the reſt?

Hence it follows, that all, or at leaſt the greateſt Part of the *Lavangi*, or petrify'd fiery Torrents diſcover'd in our Days by the *Dominicans* at the *Madonna di l'Arco*, as we obſerv'd in the Introduction, may be look'd on as the Remains of our antient *Veſuvian* Diſcharges. We ſhould be more certain of this Point, if we could preciſely fix the Æra when our *Volcano* chang'd its Aſpect, as we behold it at preſent, but as we cannot do this, we ſhall proceed no further in this Enquiry.

It is enough that we know by reiterated Proofs that our *Veſuvius* ejects fiery Torrents as well as *Ætna*. At leaſt it has poſſeſs'd this fatal Quality ſince the Time of *Procopius*, whoſe Authority puts the Queſtion out of Doubt. We cannot then but wonder at our Countryman, *Thomas Cornelio*, (*l*) who

(*l*) *Quid? quod ipſe quoque* Veſuvius *ejuſmodi materiam* who at the ſame time that he allows *Ætna* and the *Liparean* Iſles ſubject to this *Phenomenon*, denies it to *Veſuvius*; for tho' even in the Eruption of 1631 there had been no remarkable Diſcharge of this Kind, yet the Aſſertion of this Author had been ill grounded; but as all the Hiſtorians of that memorable Conflagration diſtinctly mention the prodigious Torrents of Fire, that conſum'd whole Villages, and ruin'd the Face of the Country; and as they wrote ſo long before *Cornelio*, his Error is inexcuſable.

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What is yet more ſurpriſing, is, that an Author who affects this Singularity, ſhould never remark the Uſe to which the Stones of our antient petrify'd Torrents have been for many Years employ'd by the People of *Naples*. They hew into large Squares that conſolidated Rock, which once was a Stream of fiery liquify'd Matter, and employ

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riam (quod a nemine ante nos fuerat animadverſum) ſemel ac iterum large copioſeque ejectavit? Quo hæc contigerint ævo latet penitus in obſcuro, &c. Cornelii Progymnaſma.

employ them in the Pavement of our Street.—But not to inſiſt on this, let us return to our Subject.

In the Eruption of 1631, our *Lavangi*, or fiery Torrents, were exceſſive. They overflow'd all the Side of the Mountain to the South and Weſt, and croſſing the Plain enter'd the Sea by different Channels. Ever ſince that Time, even in its weakeſt Conflagrations, *Veſuvius* has never fail'd to diſcharge ſome liquid Matter of this Sort, tho' theſe Streams ſeldom made any great Progreſs. But in our laſt Eruption of 1637, the Caſe was very different, for whether the Inflammation was more violent than formerly, whether the Torrent by iſſuing out of the lower Aperture, gain'd new Force, or whether by falling into the Vallies near the Sea, it found fewer Obſtacles to oppoſe its Paſſage; from one, or all of theſe Cauſes, it proceeded ſo far as to croſs the King's Road, and ſtop within a ſmall Diſtance from the Shore. No Tor-

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rent ever made ſuch a Progreſs ſince the Eruption in 1631.

Now this *Stream*, which ran ſo far (not to mention others, which were diſcharg'd from the Summit of the *Volcano*) and was the moſt formidable, ſprung on *Monday May* 21 about Sun-ſett, as we have obſerv'd in our *Journal*, and was preceded about 9 a Clock at Night by an audible Detonation of the *Volcano*, more violent than all thoſe that happen'd during the Eruption. Such is the Cuſtom of our *Veſuvius*, for we find by all the Accounts of former Conflagrations, that our fiery Torrents are always uſher'd by ſome ſuch Noiſes, as if theſe Diſcharges could not be made, but by the Ruin of the internal Cruſt of the Mountain, and that this could not happen without an Uproar proportion'd to the Cauſe.

We cannot however be poſitive that our principal Torrent began to flow at 9 a Clock, or if it employ'd the Interval from thence to Sun-ſett, to finiſh the melting of the liquified Matter to a higher Degree of Fluidity, or elſe to give it Time to boil from the Cavity of the Mountain, till it reach'd the Aperture thro' which it flow'd. Perhaps its Courſe began ſooner than we apprehended, tho' ſo ſlowly that we did not perceive it till the Dusk of the Evening.

To underſtand better the opening whence this *Lavange* proceeded, we refer our Readers to our Chart or Proſpect of *Veſuvius* taken from the South Weſt, which will give him a clearer Idea than the beſt Deſcription (*vide Plate* 2.)

Let us however make a ſhort Sketch of what we would deſcribe. If we divide the Height of our *Volcano* into three equal Parts from its Top to the Part we call the Baſis of its two Points, we ſhall find the Aperture of this new Torrent takes up the Middle between the two lower Parts, and we imagine it is either the ſame Cavity, or the old one open'd afreſh, which in 1631 occaſion'd the fatal Inundation that deſolated all our Territory. Above this new Crevice we ſee a large Tract of Earth hollowed by

Nature in the Shape of a Nich. It has coſt her no great Trouble on this Occaſion, for the Subſtance of the Mountain in this Part is only Sand and looſe Stones intermingled, as the inſide of the Evacuation itſelf plainly demonſtrates.

We conjecture that this Breach is the Effect of two conjunct Cauſes, *viz.* the Shock, and the Cavity it occaſion'd, the firſt rent aſunder the Coat of the Mountain, the ſecond ſwallow'd up the broken Parts at the ſame Inſtant. In this Manner probably the Aperture was form'd, and ſerv'd for a Canal to diſcharge the Maſs of liquified Matter that rag'd in the Bowels of the *Volcano.*

Some other Streams indeed iſſued from the Summit, but their Courſe was ſhort, and we can obſerve them at preſent heap'd on each other, as they cool'd in the Deſcent, and in all the various Shapes that the Impreſſion of the external Air and their own tenacious Fluidity could give them.

It is eaſy to diſcover theſe new *Lavangi*

vangi or Torrents at a good Diſtance, even after their Conſolidations, by their burnt Colour, rather than by their Elevation above the Surface, for this is not obſervable in all Places, eſpecially in the low Grounds, where it is ſcarce to be perceived by the neareſt View.

In ſurveying the Mountain we ſee divers long Tracts of a ruſty Iron Colour, mark'd along the Deſcent. Theſe are preciſely our Torrents petrified, or conſolidated by the Air; the nearer we approach their Source, this dark ferruginous Tincture appears more diſtinctly, but it fades with Time, and grows at laſt ſo effaced, that the Tract of a *Lavange* is not to be ſeen but from ſome Place, where its Elevation may be diſcover'd.

By this inequality of Colour, which is ſtill ſtronger or fainter in Proportion to the Age and Date of our *Lavangi*; we may give a tolerable Gueſs at the Antiquity of thoſe different Streams, whoſe Remains appear on the Sides of our *Veſuvius*, and by this

Rule we ſhall find thoſe the eldeſt, whoſe Aſpect leaſt differs from the Surface of the adjacent Earth; a Change occaſion'd partly by the Action of the external Air and Rain, partly by the Showers of Duſt and Aſhes, that the Winds and different Eruptions have heap'd upon the external Face of our *Veſuvian* Torrents.

Nothing can illuſtrate this Subject better than the Appearance of a Field, plough'd at different Intervals of Time; the lateſt Furrows diſcover a deeper Colour according to the Nature of the Soil, others of an older Date are of a lighter Brown, others only ſhew the Marks of the Plough by the Bareneſs of the Earth, the Traces of the Plough-ſhare, and the Looſeneſs of the Earth that diſtinguiſh them.

This Reſemblance will not only give the Reader a lively Picture of the Difference between our *Lavangi*, but alſo perfectly repreſent the State of our Mountain as to the Scabroſities or Roughneſſes of its Superficies; for as in tilling a Field we ſee thrown up innumerable Fragments of Earth of different Sizes and Figures, pil'd on each other in the moſt irregular and confus'd Manner, by the uncertain Direction of the Coulter, juſt ſuch is the Figure and Conſtruction of our *Veſuvian* Torrents.

This Compariſon will hold in every Reſpect. Whoever views our *Lavangi*, without knowing the Truth, would take them for Furrows left by the Plough, except that the Fragments of our Torrents are vaſtly larger and more pointed, as well as pil'd up in a more irregular Manner than the Softneſs of the terreſtrial Particles will admit.

In a plough'd Ground, after a ſhort Time, we ſee the Inequalities of the Surface ſubſide and cover'd with Duſt. It is juſt the ſame with our *Lavangi*; this Appearance aſſiſts us to judge of the Date of their Eruption, as well as the Degree of their Colour, and the Condition of their Surface.

This Inequality of their external Cruſt or Surface, does not appear in all Parts of the Torrent equally. They are always proportionably leſs pointed and rough towards their Sources, than where they end their Courſe. One plain Reaſon of this is, that near their Source, the Matter which compoſes them is of a more homogeneous Nature, and leſs mix'd with foreign Subſtances.

Our *Veſuvian Lavangi* are often charged on the Top with pointed Maſſes, ſometimes to 18 or 20 Palms Height; ſo we found them to be, near 100 Paces on this Side the King's Road, in that Torrent which our laſt Eruption brought ſo near the Sea. It is no hard Matter to conceive that theſe irregular Heaps are Fragments of Rocks, which have been borne down by the Impetuoſity of the Stream of Fire, but which, on the firſt Relaxation of its Fury, remain in the Poſition they were in, as appears from their being as it were incruſted in the petrify'd Subſtance of the Torrent, as Stones in Mortar when harden'd by the Air.

For almoſt the whole Length of our principal Torrent we found rocky Fragments of the ſame Sort, either thrown out by the Eruption, or carried down by the Force of the *Lavange* itſelf. They appear plainly diſguiſed with a muddy Cement or Cruſt, occaſion'd by the fiery Fluid that touch'd them in its Way, but which is ſo far from penetrating their Subſtance, that it is eaſily broke off, and, like Plaiſter, keeps the exact Shape of the ſolid Maſs it inclos'd: We ſhall only obſerve, before we leave this Article, that all theſe Stones are not equally thus incruſted, many only on that Side that faces the Torrent, the oppoſite Part being in its natural State.

We ſhall now take Notice of ſome Concretions found on the ſuperior Surface of our *Lavangi*, which ſeem not ſo much the Productions of Chance, as owing to ſome other more regular Cauſe, eſpecially as we find many of them crowded together in a ſmall Compaſs. They are globular Bodies, of a pretty exact circular Form, conſidering how many different Cauſes might affect or alter their Shape. They are indifferently hard, and have nothing very extraordinary in their Colour or Appearance, but their Conſtruction is ſomething ſingular, and affords us Room to conjecture how they are produced.

They are compos'd of ſeveral Foliations or Lamina, each of the Breadth of two or three Inches divided from each other like the *Bezoar* Stone, or others produced in the animal Bodies. Theſe laminal Circles are eaſily ſeparated. They are of various Sizes, the largeſt we found was about four Palms in Diameter, and was near the Highway before-mention'd, on the Side towards the Mountain. Theſe Globes ſeem to be of the ſame Subſtance with the Torrent itſelf.

It remains at preſent to deſcribe the Dimenſions of our *Veſuvian* Torrents, that the Reader may at leaſt give a Gueſs in general at the Quantity of liquify'd Matter ejected by our *Volcano*, at the laſt Eruption. We have meaſured this as carefully as poſſible, tho' every one knows, that in Caſes of this Kind, it is not poſſible to arrive at a ſcrupulouſly minute Exactneſs.

The Length of our principal *Lavangi* proceeding from the lower Aperture, and ending near the Sea, we found to be about 3350 *Neapolitan* Canes *(m)*. For the firſt 750 Canes (or Roods) reckoning from the Source of the Torrent, its Breadth was the ſame, and its Depth eight Palms. For the laſt 2800 Canes, eſtimating it at a Medium taken from Obſervations in ten ſeveral Places, the Breadth was 188 Palms, the Depth 30. As to the Streams that are branched from it we found the one which fell into the Vineyards 1150 Canes in its whole Length of which, by a like Computation, 1050 were 250 Palms broad, and 10 deep, and the reſt about 100 Palms broad. The other Stream, which extended

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(m) The *Neapolitan* Cane is eight Palms, a *Neapolitan* Palm is $\frac{5}{6}$ of the *Paris* Foot; ſo that ſix of their Palms is equal to five Foot *French* Meaſure. This makes the Length of the Torrent 134,000 *French* Feet.

tended towards the *Capuchins*, was 1800 Canes long, its Breadth 548 Palms, its Depth 20.

So that from the preceding Computation it follows, that the total Quantity of the fiery liquify'd Matter, ejected by our *Volcano* in the laſt Eruption, amounts to 595,948,000 Cubic Feet, excluding the Stones and Aſhes thrown out, as well as the Torrents that iſſued from the Summit, and which made no conſiderable Progreſs.

CHAP. III.

Of ſome further Particulars obſervable in the Veſuvian *Torrents.*

WHAT has hitherto been ſaid with Reſpect to our *Lavangi*, or *Veſuvian* Torrents, chiefly relates to their external Qualities. We ſhall now make ſome more particular Obſervations neceſſary to illuſtrate the Subject, and ſubjoin our own Remarks.

It is one Thing to conſider our Torrents in their fluid State, and another to regard them when they have been conſolidated by the Impreſſion of the external Air.

In the firſt Caſe, a *Lavange* ſhows but three remarkable Qualities; 1. Its State of Fluidity, by which it flows like other liquid Bodies. 2. Its red or fiery Colour. 3. Its conſuming Heat.

Our Torrents, beheld at a Diſtance in the Dark, give a Light, not like that of a bright Flame, but more dull and faint, ſuch as Bodies heated in a Furnace red-hot. When you approach them pretty near, you preſently are ſenſible of their violent Heat, which is fatally deſtructive to Houſes, Trees, or whatever elſe lies near their Paſſage.

As ſoon as the Rage of this Fire begins to abate, the Torrent, loſing its Fluidity, congeals into a hard and brittle Stone; it next loſes its fiery Colour, and laſtly its Heat, which it retains longer than all the reſt of its Qualities.

We ſhall now examine the firſt Article, viz. the Fluidity of our *Veſuvian Torrents*. This reſembles that of melted Pitch, or rather of Glaſs in its State of Liquifaction.

This Fluidity, however, is neither equal in all our Torrents, nor even in different Parts of the ſame Torrent; for beſides the Diverſity ariſing from the Mixture of heterogeneous Bodies, more or leſs ſuſceptible of Fuſion, the Degree of Fire has certainly a great Influence in giving a proportional Degree of Fluidity.

Hence it is eaſy to account, why in our laſt Eruption the Torrent that iſſued from the new Aperture at the Foot of the Volcano, was much more liquid than thoſe that flow'd from the Summit, as was apparent from their Motion; no doubt it was owing to the Activity of the Fire, which was greater in that Part of the Mountain than at the Top. The ſame Rule alſo proves, why our Torrents are always more fluid towards their Source, and in Proportion to the Length of their Courſe grow leſs and leſs liquid.

If the melted Subſtances that compoſe our *Lavangi* are not equally liquid in all Eruptions, or if their Fluidity appears ſtronger or weaker in various Parts of the ſame Torrent, the Inequality is the ſame with Reſpect to the external Surface, and the Inſide of the ſame Streams, for ſeveral have remarked,

marked, that in ſtriking with a Stick the Outſide of a *Lavange*, yet running, they found it hard, ſometimes to that Degree as to give a hollow Sound, while the Inſide was certainly fluid, otherwiſe it could not have held on its Courſe.

We are not ignorant, that ſome Perſons, notwithſtanding what we have ſaid, may deny this Fluidity, or to ſpeak more properly, this Liquidity or Softneſs of our *Veſuvian* Torrents. They may imagine, that they are nothing but a Maſs of Cinders and burnt Stones, driven forwards by the Force of the Fire, impelling them without Intermiſſion, juſt as we ſee the Stones and Mortar of a Houſe that falls down, tumble in one Body, and Form by their Contiguity, if the Place be ſteep, the Reſemblance of a rapid River.

This Idea (tho' abſolutely falſe) ſeems to meet ſome Support, from a View of our Torrents themſelves, at the Time they run; for you then perceive nothing but broken Stones, Pieces of Rock, Maſſes of Earth and Aſhes, which daſh on each other in a noiſy Manner, without ſhowing any Marks of the Fluidity to which they owe their Agitation.

But two Things are ſufficient to ſhow the Error of this Notion, if duly attended to. 1. We need only obſerve the Inſide or Subſtance of our Torrents, and we find this ſo firm, ſo uniform and compacted, and ſo cloſely united in one Body for a long Tract of its Courſe, that it is eaſy to judge it was once a Fluid, but conſolidated by Time. 2. The Cruſt or Varniſh which we have mentioned, as join'd to the Stones, which the Torrent meets in its Paſſage, and which, when ſeparated, preſerves their Figure ſo exactly, puts the Matter out of Queſtion; for if our Torrents were not at firſt ſoft and fluid, they could never in this Manner cover Stones, Nails, and other ſimilar Subſtances, which we find often as it were incloſed by them.

We have enter'd into this Diſquiſitil on that we might aſcertain the origina- Fluidity of our *Veſuvian* Torrents, the rather, becauſe to view them *en paſſant*, we do not ſo eaſily perceive the Truth. This has occaſion'd ſome celebrated Writers to fall into an Error, or at leaſt to expreſs themſelves obſcurely on this Article, as we ſee *Caſſiodorus* calls our *Lavangi* a Collection of Aſhes; *Caraſa* (*a*) and *Borelli* (*b*) are equally faulty in their Expreſſions (*c*).

To

(*a*) *Caraſa* ſpeaking of our *Veſuvian Lavangi* under the Title of inflam'd Aſhes (*ignitus cinis*) ſays expreſsly, "Now thoſe Aſhes are grown ſo hard, that "they ſeem to be turn'd to Stone." [*Nunc adeo obduruit cinis ille, ut in lapidem diriguiſſe videatur.*] This plainly ſhews that he did not underſtand the Nature of our Torrents, at leaſt with Regard to their Fluidity. *Vid.* Caraſa *tract. de conflagrat.* Veſuviana.

(*b*) *Borelli* in his Relation of the Eruption of *Ætna*, calls theſe Torrents by the Name of *Graïs*, tho' in other Reſpects his Deſcription is pretty exact, and agreeable to Truth.

(*c*) Amongſt other Writers who have miſtaken the Nature of our Torrents, we may reckon *P. Le Ruë*, in his Edition of *Virgil in uſum Delphini*, where, explaining the Expreſſion of *Liquefacta Saxa*, made Uſe of by the Poet, he paraphraſes it thus, *Saxa exeſa & igne comminuta, ſeu pumices aridos & ſpongioſos, quos inde conſtat magna interdum copia erumpere.——Exeſa in pumices, commutata in cineres, qui, torrentium inſtar, inde erumpunt, &c.* Nothing can be more heavy or diſagreeable to Truth than this Interpretation. The *Latin* Poet had, however, painted the Thing in the exacteſt Manner.

To return to our Subject we ſhall now examine the different Degrees of Fluidity that appear in the Outſide and Inſide of our Torrents; we have already remark'd, that the external Surface is commonly hard, even while the Inſide is ſtill fluid enough to run.

Borelli in his Treatiſe afore-mention'd, has taken Notice of this Phenomenon, and attributes it to the Impreſſion of the Air, which cools the Surface, ſo as to ſtop its Courſe, while the inner Part retains its Heat, and conſequently its Fluidity.

This Idea appears to us rational and juſt. If ſome, however, think this ſudden Change produced by the Air improbable, we ſhall confirm *Borelli*'s Opinion by a plain Example, that will put the Queſtion beyond Diſpute.

It is that of liquify'd Glaſs, which poured red-hot from the Furnace, yet preſently congeals, and in a ſhort Time grows quite hard, when expos'd to the Air. At the ſame Time it aſſumes a great Degree of Fragility, a Quality quite oppoſite to its original Fluidity and Softneſs.

In this Transformation we muſt not only regard the Force or Impreſſion of the Air, but alſo the Conſtitution and Nature of the melted Subſtances, or Bodies, upon which it acts. For tho' we ſee Pitch, Bitumen, and other Bodies of a ſimilar Kind, after their Liquifaction, coagulate on the firſt Contact of the Air, yet they are far from acquiring thence any real Solidity or Hardneſs, which is a Quality in ſome Meaſure contrary to their Nature. For the oppoſite Reaſon, Glaſs and Metals after their Fuſion reſume their natural Hardneſs, as ſoon as the Action of the Fire ceaſes its Effect.

But not to mention the Impreſſion of the Air, there is another Cauſe, why the the external Cruſt of our inflam'd Torrents, differs from their Inſide with regard to Conſiſtency. For all the various Maſſes that we ſee on the Top or Outſide of a *Lavange*, ſuch as Pieces of Rock, Flints, Earth and Gravel, are no way the conſtituent Parts of the Torrent itſelf, but probably an accidental Addition it gathers in its Courſe, or the Ruins of the Aperture thro' which it forces its Way at its firſt Eruption. In either Caſe we may conſider theſe as foreign Bodies, which the Fire has neither Time nor Force to liquify, but only to burn, or calcinate, according to their different Natures, and from thence proceeds the quick Congelation of the external Cruſt of our *Lavangi.*

Many Reaſons determine us to judge in this Manner, 1. on the Outſide of our Torrents we often find Stones not leſs different from each other, than from the Inſide or Core of the *Lavange* itſelf, which could never happen, if, as *Borelli* thinks, theſe Maſſes were only Fragments of the external Cruſt, which, form'd on the *Lavange* by the Impreſſion of the Air, were broke by the irregular Motion of the Fluid underneath; for ſince we ſee, after ſome time, the Core, or inner Subſtance of our Torrents fall into the ſame State of Hardneſs, both the one and the other, according to *Borelli*'s Notion, ſhould exhibit a Homogenity of Parts. 2. The Places of our Torrents that are cover'd with the greateſt Quantities of Stones and Gravel, are thoſe that lie the fartheſt from their Source, which plainly ſhews, that they are extraneous Subſtances collected by the Violence of the liquify'd Matter in its Courſe. 3. The Bottom, or inferior Part of the Torrent next the Earth is alſo cover'd with a porous Cruſt, remarkably ſharp and pointed, in producing which, the Air ſeems to have no Part; for between the Ground and the liquify'd Matter, which is of a ponderous Nature, there can be no Space for the Air to effect ſuch a Congelation, ſo that we rather judge, that this inner Coat, or Skin, is form'd of Earth, Sand and ſmall Pebbles, all, as it were bak'd, together by the Intenſeneſs of the Heat, and incruſted at the Bottom of the Torrent.

All theſe Reflections appear much more ſtriking from an attentive View of the Thing itſelf. The bare Conſideration of one of our *Lavangi* is ſufficient to ſhew, that, beſides the liquify'd Matter prepar'd in the Bowels of the *Volcano*, they gather in their Paſſage a Quantity of foreign Bodies, whoſe Weight, Conſiſtence and Colour undergoes different Changes from the Heat of the Torrent. Hence proceeds the quick Congelation and Hardening of their external Surface; hence alſo we ſee the Reaſon, that, in Proportion as they are nearer their Source, their outward Cruſt is ſmoother and of a darker Colour, becauſe it is not yet altered by the Addition of other Bodies.

After all, we muſt confeſs, that the Fluidity of our *Veſuvian* Matter is but weak, and far from being equal to that of Water or other liquid Bodies, as we ſhall further ſhew when we come to obſerve the Motion of our Torrents. We ſhall only here give our Readers one remarkable Example of this, of which we had ocular Demonſtration.

Not far diſtant from the new Aperture, from whence proceeded the largeſt Torrent in our laſt Eruption, we took Notice of a Place where the liquify'd Matter ſtruck the Foot of a Rock, which lay directly in its Way. Here it daſh'd like a Liquid, whoſe Courſe was rapid, and a Part of the Fluid roſe, about four Inches, above the Top of the Rock itſelf. This Part, inſtead of ſpreading, or falling back to the liquid Maſs, or Current beneath, remain'd conſolidated, or petrify'd, in the ſame Condition, nearly reſembling one of theſe Vegetations ramified, which the Chemiſts produce, in their metallic Opperations, at the Bottom of the Vaſe or Glaſs.

Now this Phenomenon plainly proves two Things, *viz.* the extream Tenacity of the Fluid, and the extream Elaſticity of the Air; for if both had not co-operated on this Occaſion, the Experiment could never have ſucceeded, as we ſee it has done, tho' the liquify'd Matter, ſo near its Source, muſt have had a greater Degree of Fluidity and Heat than elſewhere, as we ſhall ſoon have further Occaſion to ſhew.

Another Quality of our *Veſuvian* Torrents is the Violence of their Heat, under which Head we ſhall comprehend, 1. its Force or Activity; and, 2. its Duration, both of which are truly wonderful.

I. The violent Heat of our fiery *Lavangi* is certainly terrible; ſince, by common Experience, as well as the Doctrine of the beſt Naturaliſts, the Action of Fire is uſually proportioned to the Denſity of the Body which it invades, we may readily judge the exceſſive Heat that ariſes in our *Veſuvian* Matter.

This Aptitude of Bodies to receive and retain the Principles of Fire, or their inflammable Quality, does not proceed from their Denſity alone, ſince we find ſome Bodies in their Nature more accenſible, or ready to receive the Impreſſions of Heat, than others. Thus, tho', by Means of their Denſity, all Metals grow more violently hot than lighter or thinner Bodies; and for the ſame Reaſon, a cloſe-grain'd and knotty Wood makes a ſtronger Fire, than ſuch as is light and porous; yet by the ſecond Rule, or Nature of Bodies, we find certain Minerals, ſuch as Bitumen and Sulphur, more accenſible than other Bodies of greater Gravity and Solidity; and by the ſame Cauſe, without doubt, Gums, Roſin and Oils, tho' lighter than Water, yet by their glutinous Quality take Fire with ſurprizing Celerity.

Since then this Denſity in Bodies, as well as their ſecret accenſible Nature, make them natural Furnaces, or Receptacles of Fire, we may ſoon eſtimate the violent Heat of our *Veſuvian* Torrents, and that without examining whether they contain any Mixture of Metals, or in what Proportion that Mixture is; it is ſufficient to regard their Denſity, or ſpecific Weight, to judge of their inflammable Diſpoſition, and when to this we join the Quantities of Sulphur, Bitumen, and Salts produced by our *Volcano*, we ſhall be convinc'd that the Heat of our Torrents, is equal to that of the moſt violent Furnaces on Earth. This may give the Reader a general Idea of the Truth; we ſhall now proceed to examine the Degree of this Heat by the Obſervations and Experiments we made on the Spot.

On *June* 5th, that is fifteen Days after the Eruption of the principal Torrent, ſome of our Members went to the *Greek Tower*. The Day had juſt begun to dawn, the Air was yet dusky, they approach'd the Torrent, carefully ſurveying every Object that preſented itſelf, and they ſoon met with one that employ'd all their Attention.

Not far from the *Carmelite* Monaſtery, we diſcover'd on the Back or Surface of the Torrent, a Hollow of about two Palms deep, form'd by the Interval of ſeveral Stones irregularly heap'd. Thro' this Opening we viſibly perceived at the Bottom a kind of Furnace, which burnt yet with that Violence, that the Stones were as red as the hotteſt Coals. We ſucceeded ſo far that we drew out ſome of them, which we try'd with a large Smith's Hammer, that we might ſee what Degree of Solidity they carry'd in this inflam'd State. Inſtead of yielding to the Strokes they flew into ten Thouſand ſparkling Fragments, a ſufficient Proof of the Suddenneſs as well as Strength of their Petrification.

After this we took ſeveral Methods to diſcover the Degree of Heat, that yet remain'd in this natural Furnace. For this Purpoſe we let down a Piece of Lead of a Conic Form, weighing two Ounces. In two Minutes and a half it began to melt, a Minute after it was totally diſſolv'd, and running down, loſt itſelf in the Intervals of the Furnace. We then took another Piece of Lead of the ſame Form and Weight, and laid it on a red hot Shovel, placing the Shovel on a good Coal Fire. Six Minutes and a half paſs'd before the Lead gave the leaſt Sign of Liquifaction, and with Difficulty was melted in a Minute after.

Having then cool'd this laſt Piece

of Lead, and leaving it in the flat Condition it was in, we let it down on our *Veſuvian* Furnace, and in a Minute and a half it was wholly melted. We imagine that the Quickneſs of this laſt Operation proceeded, in part, from the Softneſs the Lead retain'd after the laſt Trial, and alſo from its flat Figure, which gave Room for the Heat below to act equally on all its Parts.

We next ſet on this Furnace, which the Torrent preſented us, a Copper Veſſel with a Quantity of cold Water. In three Minutes the Water begun to ſing, and in the fourth, boil'd with great Vehemence. A ſhort time after we put the ſame Veſſel with an equal Quantity of Water on a ſtrong Fire, hot enough to ſerve for a Furnace. The Water began to ſimmer in four Minutes, and at the end of five boil'd ſtrongly.

It appears from theſe Experiments, that the Heat of our Torrent, even at that Time, was ſuperior by a viſiſible Degree to that of the hotteſt

Charcoal,or red hot Iron, both which we may rank amongſt the moſt vehement Fires known in the World: What muſt we ſay then to the Heat of our *Veſuvian* Torrents in their original Exceſs, when the Experiments themſelves were made on the Inſide of the *Lavangi*, ſo late as a whole Fortnight after its Eruption; and that even when this Inſide had loſt its Fluidity? The red-hot Stones we made uſe of, were already ſo perfectly conſolidated, that they flew under the Hammer, ſo that conſequently they muſt have loſt a vaſt Degree of that Heat, that in their Birth, occaſion'd their deſtructive Fluidity.

Even in the Trials we have mention'd, if we ſhould allow, that our *Veſuvian* Fire was only equal to the common, it would follow, that the Activity or Force of the firſt was greater, as much as the Fluidity of our Torrents differ from their brittle Hardneſs. For conſidering, on one hand, that our liquify'd Matters harden by Degrees as they cool, and on the other hand, granting that our Hypotheſis is juſt, that after their thus uniting, they yet equal the moſt violent Fires that Art knows how to kindle, we muſt own, that this Heat of theirs muſt be exceſſively great, when their fiery Quality renders them fluid enough to deſcend from the Sides of our *Volcano*.

Tho' this Way of arguing furniſhes us with a juſt Notion of the violent Heat our Torrents contract in their Source, yet Truth obliges us to confeſs, that if we allow this Hypotheſis, without Exception, it may deceive our Readers, as it it ſeems to place upon the ſame Footing all the different Bodies on which the Fire operates.

Now as ſome Subſtances will liquify at the gentleſt Warmth, and others will retain their Hardneſs in the moſt violent Furnaces, it is impoſſible to come to any fix'd Judgment with reſpect to this Article, without ſuppoſing that the Diſſolution or Fluidity caus'd by Fire is in all Bodies proportion'd tion'd to the Degrees of Fire itſelf; an Aſſertion in itſelf manifeſtly falſe.

We acknowledge then, that this Reaſoning will only hold good, if we could make our Experiments, on the fluid Matter of our *Veſuvian* Torrents when inflam'd, and that on thoſe Parts of it we call the inner Subſtance or Core. The Reaſon is, becauſe, in this Part, the Matter of our Torrents appears uniform in reſpect to the Size of its Particles, or in its homogeneous Appearance, at leaſt much more ſo than the external Cruſt or Surface, which as before we remark'd, only exhibits to the Eye a Chaos of Stones and Pebbles, whoſe Variety is ſeen at the firſt View.

Theſe Reaſons to prove the violent Force and Degree of Fire in our Torrents, ſerve likewiſe to demonſtrate, that the Heat they acquire muſt be very laſting, ſince theſe three Qualities generally co-operate. 1. A Length of Time to acquire Heat. 2. The Exceſs of Heat thus acquir'd. And 3. Its Duration.

Theſe Principles once laid down, we have good Ground to aſſert, that the Solidity of the Matters liquify'd in the Cavities of our *Volcano*, join'd with the natural Properties of the ſulphureous, bituminous, and ſaline Minerals abounding there, muſt communicate to our Torrents a Degree of Inflammation not leſs obſtinate than fierce and laſting.

Experience confirms this Theory, by the Inſtance, laſt produced, of the Furnace near the *Carmelite* Monaſtery, which burnt violently at two Palms Depth, and at the furtheſt Extremity from its Source, tho' fifteen Days had paſs'd, ſince it firſt began to flow. This is further prov'd by an Accident which happen'd near a Month after, when, by the King's Order, the Workmen began to clear the High-way from the Torrent, which had croſs'd it in its Courſe. Even then the Labourers were obliged to quit the Enterpriſe, for the Inſide of the *Lavange* was ſo hot as to render unſerviceable the Shovels, Pickaxes, and other Inſtruments employed for that Purpoſe.

What is yet more extraordinary, is, that even four Months after the Eruption the Torrent emitted Exhalations of warm Smoke, ſome of which, being ſo conſiderable both for the Quantity and Thickneſs of the Vapours, roſe to fifteen and twenty Palms Height. Theſe Exhalations were, however, more obſervable near the End of the Torrent than its Source; a *Phenomenon* a little unaccountable, and which, no doubt, proceeded from this, that the Bulk or Dimenſions of the Torrent conſtantly increas'd the longer it ran; for in the Valley between the Road and the Sea, where it ſtopp'd, its Breadth and Height were ſo conſiderable as to amount to ſome Feet. Now it is certain, that an inflam'd Maſs of any Sort always retains the Heat in Proportion to its Bulk.

But as it may be queſtion'd, how an Aſſemblage of Matter, of whatever Kind or Magnitude, ſhould preſerve a communicated Heat, tho' ever ſo qualify'd, to retain it for ſo long a Space of Time, without a new Supply; we own to us it appears plauſible, that the Quantity of accenſible Minerals that compoſe our *Veſuvian* Torrents, produce in themſelves, from time to time, a freſh Efferveſcence or Ebullition, to which the foregoing Phenomena are to be aſcribed. From this Cauſe, we imagine, proceed the long Conſervation of the internal Heat, and thoſe warm Vapours, and denſe Exhalations, which, in many Parts of the Torrent, are viſible to the Eye. The Places whence theſe Fumes ariſe, furniſh us a new Proof of this; as we conſtantly there find the Stones, as it were, incruſted with Sulphur and Salts of different Kinds, as ſhall be ſhewn in the Sequel. Now that the Cavities of our *Lavangi* have Heat ſufficient for this, is evident from the Smoke itſelf, as well as other Trials; for having, near a Month after the laſt Eruption, thruſt down a Stick in one of theſe Apertures, in a few Moments we drew it out, yet burning like a

Torch half conſum'd and juſt blown out.

The long Duration of the Heat that reigns in our new *Lavangi* is further confirm'd by the Smoke they eject whenever it rains. Soon after the Eruption theſe Exhalations were remarkably obſerved, as we have taken Notice of in our Journal; and theſe Vapours ſtill continued, tho' in a weaker Degree, in Proportion as the internal Fire or Heat deaden'd and decay'd. Even the 20th of *October*, 1737, five Months after the Eruption, we obſerved from the City of *Naples*, with great Surpize, after the violent Rains which had fallen the preceding Part of the Month, that the Torrent emitted a Sort of white Miſt or Vapour in certain Parts, where no doubt ſome Remains were yet left of its priſtine Heat.

We are not inſenſible that *Borelli* is of another Opinion with regard to the *Lavangi* of *Ætna*, and his Opinion ſeems ingenious. He attributes this Phenomena, not to the Heat of the

Torrents, which, he aſſerts, are extinct, but to their having, by their Diſſolution, acquired the Quality of Lime, which, as all the World knows, diſcovers a violent Agitation, and emits a thick hot Smoke when mix'd with Water, tho', before this Union, neither the Lime nor the Water have the leaſt Degree of internal Heat. And this Notion ſeems the more defenſible, as Lime is nothing but Rock Stone diſſolved by a ſtrong Furnace, two Things that are always to be met with in Mountains ſubject to *Volcanian* Eruptions.

Notwithſtanding this Hypotheſis of *Borelli*, which ſeems ſpecious enough, we conceive, that, without attributing to our Torrents any Thing of a calcinated Nature, it is eaſy to comprehend, how the Heat, preſerved in the Cavities of our *Lavangi*, ſhould occaſion a Smoke on the Deſcent of Rain, for we ſee that Water ſpilt on red-hot Plate, or the Back of a Chimney, or other inflam'd Bodies, preſently evaporates in Smoke, as much as iſſues from Lime when water'd. Every Liquid of a ſubtile and aqueous Nature will produce the ſame Effect. That our Torrents ſtill preſerve this internal Heat is alſo plain from hence, that at certain Intervals they ſhall ſmoke, even without the Intervention of Rain.

This then gives us a plainer, and as juſt an Idea as *Borelli's*, with Reſpect to the Cauſe of the Exhalations our Torrents emit after Rain; and as this confirms the vaſt Heat that continues in our *Veſuvian* Streams, it makes directly for our preſent Purpoſe.

The Fidelity we owe to Truth, as ſincere Hiſtorians, obliges us, however, not to conceal ſome inconteſtable Experiments, which ſeem to prove that the Heat of our Torrents is not ſo violent as we have repreſented it, a Thing diametrically contrary to what we have hitherto laid down. 1. To our great Surprize, and that of all thoſe who have curiouſly traced the Cauſe of our principal Torrent, and the Phenomena it exhibited, we found, in its Paſſage, ſeveral evident Marks of the Inequality of its Heat. In ſome Places where it paſſed, not only Trees preſerved their Verdure, but even the tendereſt Herbs preſerved the Face of Spring, tho' at a Palm's Diſtance from the burning Maſs. In other Places we found Tufts of Graſs unwither'd, though ſurrounded with burnt Sones which had fallen from the Torrent in the firſt Rage of its Eruption, *i. e.* at a Time when they muſt have been intenſely hot. 2. What is yet more remarkable, and drew the Attention of the moſt vulgar Spectators, was, that at the *Carmelite* Convent, the exterior Surface roſe ſo high as to touch, and even preſs againſt the Glaſs-Work of a Window in the Stair-Caſe that led to the Dormitory, and yet the Glaſs remain'd whole; and what was yet ſtranger, the Lead, in which the Panes were fix'd, ſuffer'd not the leaſt Alteration; ſlender as they were, they brav'd the Heat, and are yet to be ſeen as firm as before the Accident; and yet this ſame Part of the

Torrent having forced itſelf by the Doors and Windows into the Refectory and Sacriſty, which lay both beneath the Window we mention, ſet Fire to all the Wainſcotting, by the Heat of its Exhalation, tho' it did not touch them.

In the Refectory, the Heat was ſo violent as to melt the Glaſſes on the Table into ſhapeleſs Maſſes, which were afterwards handed about amongſt the Curious, who crouded to ſee them.

As to the Trees which lay in the Way of the *Lavangi*, if ſome preſerved their Verdure, we found many others whoſe Leaves were ſhrunk up, dead and wither'd, even at the Diſtance of 15, 20, and even 30 Palms.

Comparing then theſe various Phenomena together, we imagine, that if the Heat of our Torrents is ſo unequal in different Parts, it does not proceed from any ſpecial Property of Reſiſtance in ſuch Matters as it meets, but we muſt ſeek in the fluid Matter itſelf the Cauſe of theſe different Effects of its embodied Fire.

Let us rather account for thoſe Inequalities from the fortuitous Aſſemblage of certain Matters in the Body of the Torrent. Let us ſuppoſe, in ſuch Parts the Subſtances that compoſe it, are either by their Nature, or the Privation of the external Air, not ſo apt to inflame, or ſubject ſoon to cool, ſo that in thoſe Places the Torrent loſes that fiery Rage and Degree of Activity that renders it in others ſo fatally deſtructive.

We now have to conſider and make ſome Obſervations on the Motion of our *Veſuvian* Fluids, which we may regard under two Aſpects, 1. Their internal Agitation or Efferveſcence. 2. Their external Motion or Progreſs.

As to the *firſt*, if we form a Notion of our *Veſuvian* Fire, and the Manner of its kindling from the chemical Repreſentations of the *Aurum Fulminans*; or the warm Ebullition we ſee riſe on the Oil of Tartar, when mixed with the Spirit of Vitriol; or Mixtures of a ſimilar Nature, we ſhall preſently conceive there muſt of Neceſſity be in our Fluids a prodigious internal Commotion, either to form their natural Accenſion, or to excite thoſe contrived by Art. There can be no Inflammation, without this ſecret Commotion, which, according to ſome Philoſophers, is the Eſſence of Fire, or which at leaſt ſets this ſubtle Element in Motion, and makes it viſible.

Undoubtedly this Conſideration is ſufficient to ſhew that the Subſtance of our Torrents can neither be inflamed, much leſs diſſolved, and ſtill leſs capable of retaining its Fluidity, if in the Point of Accenſion, as well as in its liquid State, it were not ſubject to a violent internal Agitation, or Effervеſcence, ſuch as we have deſcribed in ſpeaking of the Duration of their Heat.

Beſides this phyſical Cauſe, the Inſpection of our *Veſuvian* Matters, either in their State of Effervеſcence, or when conſolidated by the Air, convince us of the Truth of the Hypotheſis we have laid down. To obſerve them only in the *ſecond* Caſe, we ſee them diſcover, even in their external Cruſt, a Spongioſity, a Kind of Appearance ſo uncommon, that we can no Way account for it, but by ſuppoſing that at the Moment when the whole Maſs was fluid, it ſuffered a violent Efferveſcence, which ſet all its Parts in Agitation.

The external Surface of our *Lavangi* proves this Ebullition, by the ſurprizing Roughneſs, or rather Pointedneſs of its Appearance, not to mention the broken Fragments on which the others lie piled in the moſt whimſical Manner. This natural Aſperity of our Torrents is ſo odd, that nothing can be more ſurprizing, the Inequalities being perpetually varied without Rule or Connexion. In ſome Parts, however, the Cruſt of our *Lavangi* is leſs irregular, and leſs obvious to the Eye, and that happens to be preciſely in thoſe Places, where the fluid has gather'd leaſt extraneous Matter, or where it has run ſlowly for Want of a proper Deſcent to facilitate its Courſe. Here indeed we find the Back of our Torrents deeply ſurrow'd acroſs the Breadth, in almoſt parallel right Lines, the Intervals of no great Height, ſo that the whole nearly re-repreſents a Field lately plough'd up.

This Diſpoſition in the cleareſt Surface of our Torrents, proves theſe two Points, 1. This external Cruſt, produced by the Air on our *Lavangi*, even when the Inſide is yet in a State of Fluidity. 2. The internal Efferveſcence which ſwells this Surface, between its parallel Furrows, to the Height in which it appears.

From the ſame Reaſon we conclude, that our *Veſuvian* Fluid muſt be rank'd with thoſe which, in growing hard, take up a leſs Space than in their liquid State; a Point as yet not well explained with Reſpect to Fire or Water, or with Regard to *Antimony* and *Biſmuth.*

This Concluſion we found on probable Conjecture, we ſuppoſe, that while the Inſide of our Torrent is puſh'd forwards by its Fluidity, the

Outſide, yielding to the Impreſſion of the Air, is forced into a narrower Compaſs; thus, being no longer able to accompany its Contents, its Surface neceſſarily opens, and in opening muſt produce thoſe Lines in a tranſverſe Direction, which we now ſee on our *Lavangi.* The Reaſon of this is clear, as the Surface then undergoes a Kind of Force, not having Time to acquire a perfect Hardneſs, it is yet diſabled from continuing its Courſe with the interior Subſtance, having loſt the neceſſary Fluidity. Nevertheleſs the Inſide of the *Lavange*, by its Efferveſcence, endeavours to force it along with Vehemence. In this Situation it muſt of Conſequence burſt, in ſuch a Manner as to leave the Fluid below a free Courſe; and as that runs in a perpendicular Direction, its only Method to break off is by a tranſverſal Ebullition. This clearly explains the ſtrange Furrows we ſee on the Back of our *Lavangi* in different Places.

As to the reſt, if the Marks of this Agitation are ſo viſible on the Surface of our *Veſuvian* Torrents, they are not leſs ſo within their Boſom or Cavity, tho' the Subſtance there is of a more compacted Nature. Amongſt the Stones taken from our antient *Lavangi*, to pave the Streets of *Naples*, we find a Proof of this. Many of them clearly exhibit in their Maſs, *Ampullæ*, or hollow Cavities of different Sizes, in ſome more, in others leſs. Theſe Bubbles, like thoſe in Glaſs, not only plainly demonſtrate the Matter that contains them was once fluid, but that in its liquid State it was alſo effervefcent, and cool'd by Degrees, ſo as to preſerve in itſelf theſe eternal Marks of its once liquid and agitated State.

We know not how far this Obſervation, made on the paving Stones taken from our antient *Lavangi*, will hold true with Reſpect to the internal Subſtance of our new Torrent. Nature in theſe Caſes often varies her Operation, according either to the Nature of the Subſtances, or Materials, ſhe has to work on, or the accidental Impreſſions the Air beſtows on her Operations. Our old *Lavangi* (at leaſt in their Remains) do not give us the ſame Repreſentation as thoſe of later Date.

Let us now ſpeak of the ſecond Motion of our Torrents, *viz.* their Progreſſion, by which, in leaving their Source, they take their Courſe down the Mountain, ſometimes for a League in Length, ſometimes more. It needs no Philoſophy to prove what is viſible to every Eye in the Rage of our Eruptions.

We perceive at theſe Times a Torrent of Stones, red-hot, inflam'd, and ſmoaking, roll down the Mountain, taking their Way according to the Situation of the Ground: Two Things contribute to this Progreſs; 1. The Fluidity of the Maſs; and 2. The Declivity of the Ground: Now as theſe two often vary, conſequently the Courſe of our Torrents is ſeldom uniform.

The nearer the Source, the Fluids are proportionably liquid, either from the Intenſeneſs of their Fire, which is yet unabated, or from their being unmix'd with heterogeneous Maſſes, whoſe Incumbrance might retard their Paſſage.

But whether the Heat be more or leſs violent, or the Fluids themſelves more or leſs mixed, our Torrents would never of themſelves be liquid enough to run many Feet, if they were not continually ſupply'd and puſh'd forward by new melted Matter, preſſing them behind. (*a*) Hence it comes, that ſeveral Torrents emitted from the Summit in our laſt Eruption, ſtopp'd ſhort on the rocky Sides of the *Volcano*, as it were ſuſpended on the Mouth of that Gulph from whence they iſſued. Without doubt this was becauſe no new Matter urg'd them to continue their Courſe.

Not only the Fluidity of our *Veſuvian*

(*a*) The Words of *Borelli* on this Subject, in his Account of the Eruption of *Ætna* in 1614, deſerve Notice, as they confim this Truth. *Refert currere flumen ignitum decennali curſu duo milliaria tantummodo confeciſſe, licet aſſiduè promoveretur.* Borelli, Cap. V. P. 32.

ſuvian Torrents is weak, but alſo they are apt to loſe it almoſt on the firſt Contact of the Air: If ſome retain it longer, it is owing to the Conſolidation of their ſuperior Surface, which preſerves the internal Fluid from the Air, and conſequently aſſiſts it to retain its Heat a longer Time.

Thus in traverſing our Plains, when we ſee theſe Torrents do not exactly keep the Courſe of other liquid Bodies, we muſt impute it to their Want of a proper Fluidity, and to their quick Congelation in the Air. We often find in many Places, that inſtead of following the Declivity of the Ground, they take a different Channel according to the Impulſion of the Matters which puſh them on, even tho' up an Aſcent. In other Places they ſink as unaccountably, nothing can be more whimſical than their Appearance; like ſo many Stages, high or low, according to the Inequality of the Ground they paſs over.

Perhaps this *Phenomenon* may be aſſiſted by another Cauſe, for when a

Torrent thus continues its Courſe forward, even contrary to the Situation of the Ground, and refuſes to follow the Level, may it not be occaſion'd by this, that near its Sides it hardens ſooner and ſtronger, than in the Front, ſo that theſe Sides ſerve as Walls to puſh it forward in ſo unequal a Direction?

But not to ſpeak of the conſiderable Time our Torrents take, to perform a ſmall Courſe, we have other evident Proofs of the Slowneſs of their Progreſs. 1. The long Time our principal Torrent emloy'd to ſurmount the Walls of the Bridge it met in its Way to the *Greek Tower*. 2. The Reſiſtance made by the Walls of the Chapel of Purgatory to its Force, for, tho' weak, they crack'd with Difficulty, even tho' they bore the Shock of its whole Front: And they yet continue ſo ſound as to need no Reparation. Notwithſtanding they are ſo ſlender, that we may believe, an equal Inundation of Water had entirely deſtroy'd them, if it had come with its natural Force.

From all that has been advanced,

we may infer, that the Courſe of our *Veſuvian* Torrents is never ſo rapid as to deny Time ſufficient for Men and Cattle to eſcape the Danger. Conſequently when we read the diſmal Deſtruction of both in the Eruption of 1631, we ought to aſcribe that fatal Misfortune to the Stones and burning Aſhes ejected by the *Volcano*, and the Torrents of Water, which whether boiling or not, might eaſily ſurpriſe and overtake the Inhabitants and Flocks in their Flight, and involve them in one common Ruin.

CHAP. IV.

Of the Materials which compoſe our Veſuvian *Torrents.*

THO', in general, the Action of Fire is ſo vehement, that we ſee it convert whatever Bodies it ſeizes into its own Appearance, yet when it is once extinguiſhed, the Matter it leaves behind, gives ſufficient Room to a Naturaliſt to judge of the Nature of that Body in its original State, as well as of the Change it has undergone by the Force of the Flames.

Thus tho' we commonly ſpeak of our *Veſuvius* as ejecting Fire, and deſcribe its Torrents as fiery liquify'd Streams; yet when this Fire comes to abate, the the Nature of thoſe Bodies that felt its Rage, and were incorporated by it into one Maſs, remains left to a Philoſophical Examination and Enquiry. For this Reaſon a careful Obſervation of our *Lavangi*, both with Regard to their inſide Subſtance, which is the Part moſt compact, or to their external Surface or Cruſt, which is more porous, will make the Subject of the following Chapter. We ſhall from hence the better judge of the Contents of the Chapter that ſucceeds, "*On the Stones and Aſhes thrown out by our* Volcano."

To proceed in this Enquiry with all poſſible Method and Accuracy, we ſhall firſt obſerve, that if our *Veſuvian* Fire is violent to an exceſſive Degree (as has been proved) we may conclude, that the Bodies which feed it are of a Nature both to preſerve and to increaſe its Force.

Now the moſt accenſible Bodies we know, are Metals and Salts, of the ſame Kind are all oily and bituminous Subſtances. Even common Stones, when red-hot, give a violent Heat.

To theſe we may add Glaſs, which, either from the Nature of its Salts, or its compact Body when melted, takes a violent Efferveſcence.

We may then conclude, that our *Veſuvian* Torrents are compoſed either of Metals, or inflammable Minerals, or Stones, or other Bodies ſubject to Fuſion, or ſimilar Subſtances, or rather, perhaps, produced by a Mixture of all theſe together.

That our Fluids are wholly metallic, is contrary to Evidence, for we know all Metals are malleable Bodies, *i. e.* ſubject to bend under the Hammer without breaking, a Property not to be found in the Fragments of our *Lavangi*, for chuſe what Piece you will, it will fly in Pieces, rather than yield to the moſt violent Blow.

We own, that *Bocconi*, in his Letter to the Abbe *Bourdelot*, on the Eruption of *Ætna*, as well as the Abbe in his Reply, (*b*) always give the *Sicilian* Torrents the Epithet of Me-

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(*b*) *Bourdelot Recherches & obſervations naturelles. Lettres* 7 & 8.

Metallic; but they are both miſtaken, the firſt for want of due Attention, the latter for want of Opportunity to examine Things on the Spot.

If our Torrents are not purely a Compoſition of Metals, much leſs are they an entire Mixture of Salts, Sulphur, Bitumen, and other inflammable Minerals; for neither the exceſſive Hardneſs, nor the prodigious Heavineſs of our *Veſuvian* Torrents agree with the Nature of ſuch a Mixture.

Laſtly, if our Torrents were only Stones diſſolv'd, or other vitrified Bodies, how ſhould we find in them the Strata of different Metals, or ſee them intermingled with Talc and Salts of all Kinds, with an incredible Quantity of Sulphur. This laſt is prodigious, and no doubt the Reaſon why ſeveral Apertures of our laſt Torrent emit hot and miſty Vapours, which condenſing round the adjacent Rocks, incruſt them ſo as to be diſtinguiſh'd at firſt View.

Let us then allow that our *Veſuvian* Fluids are a Mixture of all theſe together;

gether: Compos'd of Metals perfect and imperfect, Minerals, Stones, and other Subſtances all vitrify'd by the Action of a moſt violent Fire. Without doubt, Nature does not on all Occaſions exactly proportion the Doſes of theſe Materials, ſo that in each Eruption our Torrents muſt vary conſiderably on this Account, and indeed their Aſpect ſufficiently confirms this Theory.

This being granted, we may aſſign a Reaſon for the different Appearances and Qualities of thoſe Maſſes that form our *Veſuvian* Torrents. To begin with thoſe Metals we call pretious, the Vulgar believe (c) they are to be found in them, and point out as ſuch certain Bits of a Gold and Silver Colour, bright and poliſh'd, which are found enchas'd in our Torrents, eſpecially in their compact interior Subſtance. To prove this, it is ſaid, that upon melting ſeveral of theſe, they form'd a Maſs of Gold, or that had, at leaſt, the Appearance of that Metal.

(c) *Thomas Cornelio* is of this Opinion.

As our Operations never extended ſo far, we ſhall leave this Point undetermin'd. Perhaps, Experience may clear up this Matter. One thing, certain is, that *Strabo*, ſpeaking of the Iſle of *Iſchia* (*d*) expreſly mentions their Mines of Gold, whoſe Revenue, not to mention the other Commodities of the Place, greatly enrich'd its firſt Inhabitants. Now if the Soil of *Iſchia* ſo nearly reſembles that of the Country near *Veſuvius*, why may we not ſuppoſe there are alſo Veins of this nobleſt Metal in the Cavities of our *Volcano*?

We can as little decide poſitively whether there are Copper, Lead or Tin, in the Compoſition of our Torrents: But we have ſtrong Reaſons to believe there is Iron, both becauſe, to view them in many Places, they look like burnt Iron, or like that Scum which the Smiths call the Droſs; as alſo, that the Loadſtone, when it approaches particular Spots of our *Lavangi*, diſcovers a ſenſible Emotion.

(*d*) *Strabo*, Lib. V. p. 379.

Now this laſt Argument appears to us concluſive, for when we ſee the Compaſs ſhew a Variation in ſuch and ſuch Places, we may readily judge, that there is Iron inequally diſtributed in the Subſtance of the Torrent.

We are not however ignorant that other Bodies, beſides Iron, ſympathize with the Magnetic Power; of this Kind is that Sort of Sand we make uſe of at *Naples* to throw on our Writing. This Sand feels the Attraction of the Loadſtone more ſenſibly than Steel Duſt itſelf.

Hence we think the Opinion of Mr *Geoffroy* (*e*) is not wholly juſt, who aſſerts, that the dark and blackiſh Sand is the only Sort which feels the Influence of the Magnet, and that the other rejects it. We know from Experience, that the Loadſtone plac'd over a ſmall Quantity of the whitiſh Kind attracts it without Exception, and that with Energy. Now of this Sort is that we uſe at *Naples*.

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(*e*) *Hiſt. de l'Academie de Sciences,* 1701.

Moreover, it is no way improbable that this paler Sand ſhould be impregnated with Iron, even in its moſt lucid Particles, tho' the Iron may have been disfigur'd by the Force of Fire, as we ſhall have Occaſion to treat more at large in the next Chapter.

But tho' theſe Appearances of Iron in our *Veſuvian* Maſſes ſeem ſtrong, yet we own we have no Proofs clear enough to decide the Matter poſitively. As to Copper, Tin, or Lead, our Uncertainty is yet greater, but we have Grounds to be a little more aſſur'd with regard to Antimony. (*f*)

Led by our Curioſity, we examin'd one Day the Condition of the Torrent that ſome Weeks before had iſſued from the new Aperture. Not far from this Source we diſcover'd in the *Lavangi* itſelf, a Deſcent or Hollow, five or ſix Palms in Length, by one in Breadth, at the Top, and three in Depth, or thereabouts. The Cavity of this Hollow was tiſſued with a

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(*f*) *Bernard Connon*, in his Diſſertation on *Veſuvius*, is of this Opinion. *Vid. Acta Lipſiſens.* 1696.

a great Number of bright or ſhining Bits, tho' the Darkneſs of the Place hinder'd us from diſtinguiſhing what they were, and the Place was not eaſily acceſſible.

We ſucceeded, how-ever, ſo far, as to get ſome of them, as alſo to gather up ſome of the Duſt at the Bottom; and on Examination, we found the whole pure *Antimony*: The Duſt was entirely an Exfoliation of *Antimony* of the ſubtleſt Kind, reſembling that ſhining and laminated Power, which ſome uſe inſtead of Sand, to throw on their Writing.

We find alſo in our Torrents abundance of *Marcaſſites* perfect and imperfect. There is alſo Talc, (*g*) but in leſs Quantity; ſome Pieces of this we have ſeen, ſo that we make no Doubt of the Truth; tho' *Macrino*, one of the moſt exact Hiſtorians, with reſpect to *Veſuvius*, ſeems to deny this *Foſſil* any Place in our *Veſuvian* Fluids. Our Torrents alſo afford us often Pieces of Chryſtal, or clear Stones of

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(*g*) *Hiſt. de l'Academie de Sciences* 1701.

of that Form, which lie inchas'd in the burnt Stones. They are not of equal Tranſparency, ſome being more lucid, others opaque.

In ſhort, The Appearances of the Maſſes that conſtitute our *Lavangi* are innumerably varied. Nothing can be more confus'd; but then nothing is more eaſy, on a cloſer View, than to diſtinguiſh them from each other by their Principles. Every one may conceive, how by the exceſſive Action of ſuch a ſubterraneous Fire, and by the Mixture of a hundred various Bodies, Things muſt change their Aſpect in ſo violent an Operation. We may even doubt if they may not be ſo metamorphos'd as to loſe their natural Figure, and aſſume a deluſive Appearance. Willing therefore, to keep cloſe to Truth in our Enquiry, we ſhall only ſpeak of thoſe Minerals that are moſt viſible, and in greateſt Quantity, *viz.* Salts, Sulphur, and a certain fat and bituminous Subſtance, which we may call *Petreolum*, or Rock-Oil.

Of the laſt our Volcano ſeems to contain an inexhauſtable Fund, as appears from great Quantities of this oily or unctuous Matter, which conſtantly floats on the Sea, near the Coaſts of our Bay. This is a Fact no body is ignorant of at *Naples*, and the rather as the Smell of this *Petreolum* extends ſometimes for Miles into the Country, when the Air is ſerene, and gently agitated by the Southern Breezes.

Sig. *Luco Antonio Porzio*, in one of his Diſcourſes of the Phenomena of *Veſuvius*, (*h*) pretends, that in 1631 a Quantity of this inflamed *Petreolum*, formed a fiery Exhalation, which ran along the Shore, upon the Surface of the Waves. However that be, our laſt Eruption has left us ſeveral Rocks and Stones all ſtained with this unctuous Subſtance, ſo that they cannot be touch'd without perceiving the Matter that adheres to them. Several of thoſe we have kept whole Months, without diſcovering that they dry'd, or recovered their natural Colour. Certainly any

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(*h*) Diſc. vii.

any other Liquor leſs viſcid and glutinous would not have produced ſo laſting an Effect.

What further evidences the great Quantities of *Petreolum*, or *Bitumen*, in the Minerals of our Volcano, is the Quality of our *Veſuvian* Aſhes, which are ſo imbib'd or impregnated with this unctuous Matter, that neither the Rain nor the Wind can diſſipate them from the Trees or Houſes on which they fall. So far is the Rain from diſlodging them, that it helps to convert them into a viſcous Paſte, which ſticks faſter.

If we further reflect on two Qualities of our *Veſuvian* Aſhes, we ſhall be convinced of this unctuous Property, which certainly proceeds from *Petreolum*, or the bituminous Liquid ſo abundant in our *Veſuvian* Receſſes. 1. Our Aſhes will not imbibe the Rain, like other terreſtrial Bodies, ſo that the Hills and Fields, when, (as in Eruptions) overcharged with theſe, admit no Rain that falls. Conſequently the Water ſeeking a new Courſe, muſt over-flow the low Grounds, if any great Rains fall after our Eruptions. Hence the prodigious Deſolation of ſuch Vallies as lye under the ſteepeſt Parts of the Mountain, becauſe the Rain rolling down without Interruption, fell in one collected Body on the Places that could firſt receive it. 2. Another Property of our Aſhes, already taken Notice of by antient Authors, and particularly *Strabo* (*i*) in Reſpect to thoſe of *Ætna*, is their Fertilizing Quality, when once they come to mix with the Earth on which they deſcend. We find from the Abundance of their Salts, that all Aſhes, in general, have the Property of improving the Ground, but tho' we ſhould allow the Salts of our *Veſuvian* Aſhes Part of this fructifying Virtue, we muſt own that, in this Caſe, the fat and unctuous Humour that impregnates them, ſhould conſiderably augment this Diſpoſition. (*k*) Thus

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(*i*) Lib. v. p. 413.

(*k*) *Habent enim pinguedinem glebæ qua igni ardeſcunt & fructus proferunt —— conſumpta pinguedine gleba reſtincta, ac in cinerem converſa, ad fruges producendas reducta eſt commodior. Strabo* lib. v. p. 379.

Thus we have clear Proofs that our Volcano abounds with an unctuous Subſtance, either Bitumen, Naptha, or Petreolum. This Liquid conſtantly flows from the Roots of the Mountain, but in the Eruptions it iſſues in greater Quantities, becauſe all the ſubterraneous Contents of the *Volcano* at thoſe Times ferment with greateſt Violence.

Sulphur is the next mineral Ingredient of our *Veſuvian* Torrents; and the greater Quantity of it they contain, the leſs we ſhall ſay of it, it being needleſs to multiply Arguments to prove a Truth that may be diſcover'd by the Sight.

We may ſafely aſſert, that in all our Eruptions this Mineral has the Precedency, not only from the vaſt Quantities of it, that cover the Stones thrown out on theſe Occaſions, but alſo from the ſulphureous Steams and Exhalations that infect the Air during our Conflagrations; alſo, it is true that no Mineral is either in its Nature ſo accenſible, or ſo fit to nouriſh the Principles of Fire as Sulphur. Around all our Torrents we find Stones incruſted with it, eſpecially where the Exhalations iſſue, which mark every Thing they touch with a ſulphureous Powder; a Proof that they proceed from this Mineral melted at the Bottom of the *Lavangi*. This Phenomenon is equally apparent with Regard to the Summit of the Volcano itſelf, which is quite lined with ſulphureous Concretions.

Laſtly. The third Mineral abounding in our *Veſuvian* Fluids is Salt, which, by the Obſervations and Experiments made on it, we find to be *Sal-Armoniac*.

This Salt uſually ſticks to thoſe Stones that receive the Smoke which evaporates from our Torrents; ſometimes our Volcano ejects it in ſuch Quantities from its Summit with the Flames, that the Peaſants gather it to uſe inſtead of common Salt. As to the firſt Sort, we find it ſticking to the Bottom of the Stones that cover the Exhalations of our *Lavangi*, juſt as we find Soot amaſſed in the Crevices of a Chimney where there is a conſtant Fire.

In one of theſe natural Vents, not 100 Paces diſtant from the King's Road, we obſerv'd a curious Phenomenon formed by the Flower of our *Veſuvian* Salt, the Particles not being regularly join'd, but diſpoſed in a moſt beautiful Form and Method.

From the Rock hung an Icicle of Salt, compoſed of an infinite Number of ſlender oblong Particles, on each Side of this ſpring ſeveral ſimilar Ramifications, which form'd the Reſemblance of Wings by their Inclination on each other, ſo that the Whole repreſented a Quill, whoſe Boll was figur'd by the Middle, and its Feathers by the collateral Branches of our *Veſuvian* Salt. This *Luſus Naturæ* proceeded ſtill further, for from this Principal Figure deſcended others ſmaller of the ſame Nature, faſten'd to its End; ſo that conſider'd altogether, it anſwer'd the Idea of an umbelliferous Plant.

Theſe *Umbellæ*, or Ramifications, carefully detach'd from the Rock, kept their Form, either laid on the Hand or on Paper, but when touch'd too rudely they diſſolv'd in an infinite Number of white Needles dry and ponderous.

Having neglected to bring a Microſcope, we could make no farther Remarks on theſe ſaline Flowers; but the Body of Salt itſelf yielded, on Trial, the following Obſervations, which may aſſiſt us to determine its Properties.

1. On ſeveral Rocks or Stones our *Veſuvian* Salt, in outward Appearance, nearly reſembles common *Sal-Armoniac.*

2. In Taſte there is this Difference, that ours is ſharper on the Tongue, and that within a ſmall Degree of being Cauſtick.

3. Our Salts differ according to the Places where we find them. All have not the ſame Flavour, or the ſame Degree of Force. In general, thoſe that are gather'd from the Stones of a dark Colour, are much ſharper than thoſe

we find on Stones of a whitiſh or yellowiſh Aſpect.

4. The ſame Quantity of Water diſſolves a larger Quantity of our *Veſuvian* Salts than common *Sal-Armoniac.*

5. On ſome Stones we found a Sort of our Salt ting'd with a yellowiſh Unctuoſity. This Salt, when put in the Fire, gave a bituminous Smell, or the Odour of *Petreolum.*

6. When caſt on red-hot Coals our Salt does not crackle, but evaporates in a Smoke of that Smell which proceeds from Smoke ariſing from Sea-Weeds when burned in the Fire.

7. The ſame Salt, try'd on the Furnace of the Torrent, near the *Greek Tower*, when hotteſt, did not evaporate at once, but by Starts, *i. e.* after a Puff of Smoke, the Exhalation ceaſed, and ſo to the End, juſt like a Pipe of Tobacco in the Mouth of a Smoker.

8. Our *Veſuvian* Salt diſcovers no Sign of Fermentation, either with Oil of Tartar, or Spirits of Vitriol, or common Salt. By this we may judge

that our Salt is neither Acid nor Alkaline (*l*).

9. Having given half an Ounce of the Infuſion of our Salt to a Dog, it occaſioned ſuch violent Convulſions, that he died in four Hours. On opening him, we found his Blood greatly rarify'd, and of a purple Colour, which it kept for ſix Hours

10. Our Salt powder'd and ſnuff'd a-while, produc'd an obſtinate and excruciating Head-Ach.

11. In order to diſcover if there was any eſſential Difference between the Salts taken from different Rocks, or if they contained no Mixture of other primary Salts, ſuch as Sea-Salt, Nitre, Vitriol, Alum, whoſe Particles always reſume their Figure in Chryſtalliſations, as the Chymiſts know, we gather'd Quantities from different Places,

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(*l*) The Chymical Writers uſually ſpeak of the Salts of *Puzzoli*, as well as ours, as if they were real *Sal-Armoniac*, as we ſee in the *Metallotheca* of *Mercato*. *Borelli* judges in the ſame Manner of the Salts of *Ætna*; Yet ſeveral Proofs ſhow, that common *Sal-Armoniac* contains Acids and Alkali, of which our *Veſuvian* Salts diſcover not the leaſt Sign.

Places, and having chryſtalliz'd them ſeparately, we examin'd them carefully with the Microſcope, by which we diſcover'd theſe three Things, 1. That there was no conſiderable Difference between the different Particles of our Salt. 2. That they contained no Mixture of foreign Salts. 3. That their Chryſtals were ramify'd, and of an odd Figure; at the End of the Ramifications hung ſeveral irregular pointed Pyramids of a ſhining Luſtre; the Intervals of the ſame Ramifications were hung with oblong rough Particles, ſome like Cylinders, others like Priſms with a Polygon-Roſe. In ſome Maſſes appear'd ſmall cubic Bodies, but theſe were rare. This proves, that Nature has unequally impregnated our Salts with a very faint Portion of Sea-Salt and Nitre. This Experiment we took Care to repeat ſeveral Times, with freſh Salt, and in different Quantities, but ſtill with the ſame Succeſs.

12. Our Salt diſſolved in common Water made it remarkably cold. It had the ſame Effect on other Liquors,

common Oil excepted; ſo that in this Point our *Veſuvian* Salt and *Sal-Armoniac* ſeem to agree, only the former gave a ſenſible Chillneſs to Brandy, on which the latter ſcarce had any Effect; as the *Florentine* Academicians (*m*) had experienced before us.

13. Having diſſolv'd two Ounces of our Salt in eight Ounces of Water, we immers'd into it the Phiol of a Thermometer eighteen Inches high. The Spirits of Wine fell four Inches and a half. Now this Liquor never deſcends ſo low whatever Salt you diſſolve in Water, not even with *Sal-Armoniac*; for Mr *Geoffroy* at *Paris*, in an Experiment made with the latter on a Thermometer of the ſame Size, found the Fall did not exceed thirty-three Lines; (*n*) ſo that, by this Obſervation, our *Veſuvian* Salt exceeds the other by 18 Lines, or an Inch and half. To prevent all Doubt we placed our Thermometer in the Water before we diſſolved

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(*m*) See Exp. 5. *Experiences concernant quelques effects du Froid et du Chaud.*

(*n*) *Vid. Memoires de l'Academie de Sciences* 1700.

diſſolved the Salt, which we kept continually ſtirr'd, ſo that we had all Reaſon to be ſatisfy'd with the Exactneſs of our Experiment.

14. Having pulveris'd a Quantity of our Salt, we threw it on ſome Snow, on which was plac'd a *Caraſon* of Water; we ſtirr'd the *Caraſon* till the Water was pretty cold, when we found it of the Taſte of ſtinking Fiſh; we then try'd the ſame Experiment with common Salt, but to no Effect, th Water diſcovering no ill Reliſh, th the Salt had Time enough to penetrate it.

15. We took a Parcel of our *Veſuvian* Salt, gather'd in the Cavities o the great Torrent, and by differen Eſſays compar'd it with the Salt o theſe continual ſmoking Apertures in the *Solfatara* near *Puzzoli*. The latter, liquify'd in an Infuſion of Galls, turn'd it of a muddy darkiſh red, whereas with our Salt the red was, indeed, a little duſky, but much more ſtrong and apparent. Neither of theſe Salts ſtained blue Paper red. Laſtly

we found, that an Infuſion of our Salt, mix'd with Oil in an Infuſion of Cream of Tartar, gave no Sign of Effervescence, but in half an Hour the Liquor became diſturbed by thin Clouds of a deep yellow Colour. The Salt of *Solfatara* gave the ſame Appearance, only that theſe Colours had a paler Aſpect, and left a white Sediment at the Bottom of the Glaſs.

According to the Method we have laid down, we now come to examine the principal Matter of our *Veſuvian* Torrents, we mean that Subſtance or Fluid, which, having run down our Mountain in its State of Effervescence, becomes, when diveſted of its Heat, a rocky Maſs brittle and heavy.

In the preceding Chapters we have ſufficiently explained the Courſe of this Matter, its Fluidity, and the Force and Duration of its Heat. We now propoſe to examine its Principles, and ſhow how Nature aſſembles them to form the Maſs of our *Lavangi*, ſuch as we have deſcrib'd it, ſuch as it may be ſeen in the Neighbourhood of our

Mountain, and even in the Pavement of our Streets at *Naples*, which is wholly compos'd of the Stones of our Torrents, either antient or modern.

But as we know nothing can be added to what *Borelli* has ſaid on this Subject, in his excellent Deſcription of the Torrents of Mount *Ætna*, we ſhall give the Reader his own Words, and ſubjoin ſome Reflexions on what he has advanced.

The XII. Chapter of *Borelli.—On the Origin and Production of the Fluid and vitrify'd Matters ejected by the Eruption of Mount* Ætna.

'Having already explain'd the Na-
'ture of the Flames, and the Manner
'in which our *Ætnean* Materials are
'kindled, it is now proper to enquire
'into thoſe fluid Maſſes which we ſee
'in our Fields, where, in their inflam'd
'State, they carry Deſolation and
'Terror.

'Nothing is more certain than what
'has been obſerved before me by
Franciſco

‘ *Franciſco Arezzo*, a noble *Syracuſan*, than that the Sulphur and Bitumen liquify'd in the Cavities of *Ætna* could never, by any Transformation, produce the main Body of our petrify'd Torrents, or thoſe enormous Maſſes of blackiſh Rock we call *Grais*, in *Sicily*. We ought rather to conjecture, that the Earth and and Gravel of the Mountain being diſſolved by the exceſſive Heat of the ſubterraneous Fire, acquire a Fluidity equal to that of ~~vitrify'd~~ liquefied Glaſs, which, by the Impreſſion of the Air, harden to the Form we ſee: Upon this *Virgil* founds his beautiful Deſcription;

> *Videmus undantem ruptis fornacibus Ætnam*
> *Flammarumque globos, liquefactaque volvere ſaxa.*

‘ We know by Experience, that liquify'd Sulphur and Bitumen will never produce a Glaſſy Subſtance. For this we muſt either have triturated Marble, or Sand mixed with Alcaline Salts. Theſe, with a violent Fire form a Fluid proper for Vitrification.

‘ In Glaſs-Houſes we ſee, that in a ‘ hot Furnace cloſe ſhut up, with a ‘ few Holes for Evaporation, the Fire, ‘ impriſon'd in the Recipient, impetu‘ ouſly ſeeks a Paſſage. Now if by ‘ Chance one of the Sides be weaker ‘ than the reſt, it immediately yields ‘ to the internal Effervescence, not ‘ without viſible Violence and Agita‘ tion. Immediately thro' this Crevice ‘ you ſee fall out the Ruins of the Co‘ ver, followed by the liquify'd Glaſs, ‘ yet red and flaming, which quickly ‘ hardens, on the firſt Contact of the ‘ Air, to a ſolid and brittle Subſtance.

‘ We are apt to believe that Nature ‘ acts in this Manner in the Eruptions ‘ of out *Sicilian* Volcano. Let us on‘ ly then ſuppoſe that *Ætna* contains, ‘ either in its Cavities or Bottom, a ‘ vaſt Quantity of accenſible Matter, ‘ which is as inflammable as Gun‘ powder. Let us imagine that this ‘ Matter finds in theſe ſubterraneous ‘ Receſſes a conſtant Nouriſhment, ‘ and that while the Volcano is quiet, ‘ this Matter is ſo conſtituted, that the

‘ Fire only preys on that Part of its ‘ Superficies that feels the Air, like a ‘ lighted Taper which the Flame feeds ‘ on by Degrees, without ſeizing the ‘ whole at once.

‘ Things thus diſpos’d, let us con‘ceive the Inflammation begin in ſuch ‘ Cavities of the Mountain as have ‘ no other Vent, but a few Holes. The ‘ Fire ſhall then diſſolve and liquify ‘ the neighbouring Rocks and Earth, ‘ juſt as it does in the Furnaces of the ‘ Glaſs-Houſes.

‘ The Conflagration thus begun, the ‘ inſide Cruſt of the Mountain falls in, ‘ the Mountain ſwells or ſhakes, and ‘ produces thoſe Earthquakes that ge‘nerally precede our Eruption. Then ‘ follows the Detonation or Noiſes ‘ heard; the Cieling of the Cavities next ‘ burſts in the weakeſt Places, and gives ‘ a Paſſage to the Smoke, Aſhes, and ‘ broken Stones that iſſue with a prodi‘gious Tumult. Laſt of all flows out, by ‘ the ſame Opening, the burning vitri‘fy’d Fluid, and runs down as the Situ‘ation of the Ground will permit.

‘ In a ſhort Time the Air hardens this ‘ liquify’d Matter, which by Degrees ‘ acquires a petrified Solidity, which by ‘ its brittle Nature ſplits and breaks, ‘ when puſh’d forward by new Matter; ‘ thus our Torrents take their Courſe ‘ along our Plains.

‘ We have hitherto only ſhewn the ‘ Poſſibility of this *Phenomenon*, we ‘ ſhall bring ſome Examples and Rea‘ ſons to demonſtrate its Probability.

‘ It is inconteſtable, that by the ‘ Force of our ſubterraneous Fire, the ‘ ſandy Earth and looſe Stones that ‘ form the internal Cruſt of our Vol‘ cano, may be liquify’d like Glaſs or ‘ Metals. This we know by Experi‘ ence. In a reverberating Furnace ‘ we find theſe Bodies ſubject to Fu‘ ſion, provided we join certain Salts, ‘ ſuch as Nitre, Tartar, Vitriol, &c. ‘ The ſame Thing happens in the ‘ Glaſs-Houſes, for to put in the Fur‘ nace Gravel, or Bits of Marble, ‘ without the proper Salts, would be ‘ by the Rules of their Art, a vain ‘ Attempt, and produce no Effect, but

‘ add the Alcaline Salts contained in ‘ the Pot-Aſhes, and the whole Maſs ‘ becomes preſently ſoft and liquid.

‘ Now as we find Sulphur and Salts ‘ of ſeyeral Kinds in the Cavities of ‘ *Ætna*, as we have ſhewn, and as our ‘ Torrents abound with *Sal-Armoniac*, ‘ it is plain that the Stones and Earth, ‘ in our Subterranean Cavities, by the ‘ Force of Fire and ſuch ſtrong Diſſol‘ vents, muſt fall into Fuſion, equally ‘ as the Materials in a Glaſs-Houſe.

‘ An Experiment we made at *Cata*‘ *nea* verify'd this Fact; we plac'd in ‘ a hot Furnace ſome Crucibles full of ‘ the proper Materials for Glaſs. Theſe ‘ Crucibles, which were made of that ‘ blackiſh and ferrugeneous Stone ‘ which compoſes the Body of our Tor‘ rents, were melted by the Fire, even ‘ before their Contents became fluid.

‘ When we conſider ſuch convincing ‘ Proofs, we muſt wonder at the Error ‘ of *Carroſa*, as well as that of other ‘ Writers, who abſolutely deny that ‘ the fluid Torrents which iſſue from ‘ our Volcano, are a Tranſmutation of

‘ the Sand Stones of its Cavities. This ‘ Notion they found on a real Fact, ‘ from which they draw a falſe Conſequence. The Thing is, that all the ‘ Sand and Stony Bodies that accompany our Torrents do not become ‘ fluid, tho’ the Torrent be ſo itſelf. ‘ We often find them preſerving their ‘ firſt Shape and Nature, tho’ incruſted ‘ over with the Subſtance of our Liquid, juſt as the Stones of a Wall ‘ are diſguis’d with the Plaiſter or ‘ Mortar that once connected them.

‘ In anſwer to the Conſequence they ‘ draw from this, we reply, that they ‘ forgot to remark, that our fluid Matter, when expoſed to the open Air, ‘ begins to loſe the primitive Heat it ‘ acquired in the ſubterraneous Furnaces, ſo that it is no longer capable ‘ of melting the Stones or Gravel that ‘ it meets by Chance in its Progreſs. ‘ It is juſt as if we ſhould pour from ‘ the Furnace a Quantity of liquid ‘ Glaſs upon cold Stones or Gravel. ‘ No Fluidity would happen, becauſe ‘ the external Air immediately checks

‘ the Degree of Heat neceſſary to pro‘duce a Fuſion; but throw the ſame ‘Materials into the Furnace itſelf, and ‘they ſhall immediately unite and li‘quify with the reſt. From this we ‘have no longer Room to doubt but ‘our Torrents are a Fluid compos’d of ‘the Stones and Earth liquify’d in the ‘Cavities of our *Sicilian* Volcano.

‘There is another Miſtake in ima‘gining the Maſs of our Torrents to ‘be metallic, becauſe of its fluid Qua‘lity. We have already ſhewn Earth ‘and Sand to be Subſtances proper for ‘Liquefaction, by the Example of our ‘Glaſs-houſes. Let us confirm this by ‘a plain Inſtance. Take a ſmall Quan‘tity of burnt Earth and bits of Brick, ‘place them in a Lime-Kiln, and in ‘a ſhort Time you will perceive them ‘turn of a blackiſh Colour, grow ſoft, ‘and at laſt diſſolve and liquify like ‘melted Glaſs. Let them cool, and in ‘Solidity and Colour they will exactly ‘reſemble the Maſs of our *Ætnean* ‘Torrents.

‘I will venture to aſſert then that

‘ our *Sicilian* Torrents are neither com‘ pos’d of Metals nor Bitumen. The ‘ Cavities of our *Volcano* want neither ‘ Stones nor Gravel, the Bodies moſt ‘ proper for Vitrification. The only ‘ Doubt ſeems to ariſe from the Rough‘ neſs and Opacity of our petrify’d ‘ Torrents, two Qualities which no ‘ way agree to Glaſs, whoſe external ‘ Surface is ſmooth, and its internal ‘ Body tranſparent. The laſt Example ‘ will remove this Difficulty, for we ‘ find in the Caſe of Bricks diſſolv’d ‘ in a Lime-Kiln, that tho’ they liqui‘ fy, yet they remain rough, and with‘ out the leaſt Sign of Tranſparency, ‘ juſt as in our Torrents, the principal ‘ Reaſon of which, no doubt, proceeds ‘ from the heterogeneous Nature of ‘ the Maſſes liquify’d in the Furnaces ‘ of *Ætna*.

‘ To illuſtrate this, one need only ‘ mix a little Sand with melted Glaſs, ‘ and the Glaſs will become foul, and ‘ rough; or let us place in the ſame ‘ Furnace triturated Stones, and Mar‘ ble of different Kinds and Conſiſt

‘ ency, and the Fuſion will produce a ‘ vitrified Maſs, thick and of a rugged Surface.

‘ If on the contrary, the Materials ‘ be of Stones of the ſame Quality, triturated to an equal Fineneſs, the Fuſion will produce Glaſs clear, ſmooth, ‘ and perfectly diaphanous.

‘ The Application is eaſy. The ‘ Earth and Stones diſſolved in the ‘ Cavities of the *Volcano*, are neither ‘ of an equal Fineneſs, or of a homogeneous Nature. Hence ariſes a Maſs ‘ vitrify’d indeed, but impure and ‘ groſs, ſo that we can neither wonder at the Inequality of its Surface, ‘ or its want of Tranſparency. In the ‘ Fuſion of homogeneous Bodies, we ‘ find they only become poliſhed and ‘ lucid as their Particles in Proportion ‘ reſemble each other in Make and ‘ Weight, ſo that they deſcend equally, and mix intimately with each ‘ other. But when this neceſſary Uniformity is wanting, it happens that ‘ ſome Parts liquify ſooner than others, ‘ ſome ſink by their natural Gravity

‘ to the Bottom, others by their ‘ Lightneſs float at top, as Wood on ‘ the Surface of the Water: So that, ‘ ſo odd a Mixture muſt conſequently ‘ produce a Maſs quite diſſimilar from ‘ its whole Body, as well as irregular ‘ in its Surface. Add to this, that ‘ there is another Reaſon why the ‘ Surface of our Torrents can never ‘ be ſmooth, but muſt remain rough or ‘ undulated.

‘ To prove this, let us conſider, ‘ that the Surface of the Torrent, ‘ when expos'd to the Air, preſently ‘ hardens, tho' not with equal Solidity, ‘ the internal Parts by Means of the ‘ central Fire ſtill preſerving their Fluidity, ‘ ſo that they take a longer ‘ Time to faſten and congeal, and ‘ we ſee our Maſs compos'd in this ‘ Caſe of a Cruſt partly ſolid, and a ‘ Subſtance partly ſoft or fluid, ſolid ‘ with regard to thoſe Parts that ſooneſt ‘ loſe their Liquidity, flexible with ‘ regard to thoſe that longeſt preſerve ‘ their Fuſion.

‘ Now when this internal Subſtance

'comes to condenſe, the external Cruſt 'being already harden'd can no longer ply, or unite itſelf equally with 'the reſt, ſo that the moſt conſolidated Parts of it retain their Situation, while others ſink upon the internal Maſs. Thus the Top of our 'Torrents become wrinkled, juſt like 'the Forehead of an old Man: In 'Youth, the Fleſh keeps the Skin 'ſoft and plump, but with Age the 'natural Juices decaying, the Skin 'falls in and ſhrinks, and finding no 'longer an equal Subſtance underneath 'to ſupport it, preſents to the Eyes 'the Image of a furrow'd Field, where 'the Inequalities proceed from the 'Softneſs and Roughneſs of the Soil.

'The Difference of the Materials 'that compoſe our Torrents may well 'produce this *Phenomenon*, which is 'further aſſiſted by the Manner of 'their Courſe, for the Cruſt which begins to harden, is obliged to move 'with unequal Velocity in Proportion 'to its Diſtance from its Source. The 'more ſlowly it proceeds towards the

‘ End of its Progreſs, the Inequality
‘ of its Surface increaſes, as Wrinkles
‘ do with Age, and the whole Maſs
‘ preſents a wild Aſſemblage of rough
‘ Subſtances, juſt like thoſe in a Field
‘ newly plough’d up.

In our Opinion, this Doctrine of *Borelli* plainly proves that the Subſtance of our Torrents is compos’d of Pebbles, Stones, and ſandy Earth, all liquify’d by the Heat of a violent Fire, aided by the Mixture of Mineral Salts, which by their inflammable Nature contribute to compleat the Fuſion. Theſe Materials thus vitrify’d, keep the Properties of Glaſs in their Congelation, being equally brittle, heavy, and extremely hard. If they want the Tranſparency and Softneſs, it proceeds from the heterogeneous Nature of their Particles, which produce a harſh and unequal Mixture, ſuch as we ſee in coarſe Glaſs, compos’d of different Subſtances.

The Examples of the Conſtruction of Glaſs and the Vitrification of Brick produced by *Borelli*, ſufficiently demonſtrate this *Theory*, as they are further ſupported by the Inſtance of the Fire of ſtrong Burning-Glaſſes, as was prov'd at *Florence* in 1694 and 1695, and is atteſted in the *Journal de Sçavans* for *Italy*. * The Fire was ſo violent there as to tranſmute into Glaſs all Bodies that fell within the Rays of its Focus. Such as Stones, Wood, Plants, Fruit, Linnen and Woollen Cloth, Chocolate, Cheeſe, and other Subſtances. Even Jewels (a few excepted) underwent the ſame Metamorphoſis. Mr *Homberg* tells us that on this Occcaſion Gold and Silver diſſolved to Vitrification, (*a*) and when the Criticks attack the Experience of ſo great a Man, they diſcover their own Weakneſs, rather than prejudice his Reputation. (*b*)

It is eaſy to conceive, that when we

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* Tom. 8. Art. 9. p. 221. *The Inſtrument employ'd, is there call'd a Burning-Glaſs, whereas it was really a* Lentille, *or Concave of Steel. We have one of the ſame Kind at* Naples, *which belong'd to the Dukes of* Parma.

(*a*) Hiſt. de L'academie de Sciences, 1702.

(*b*) *See the* Journal de Sçavans d'*Italie*, *Tom. xxx. Art.* 12 *p.* 341.

employ a ſtrong Fire, ſuch as is made in our common Furnaces, we muſt uſe ſome Vehicle to vitrify the Materials to be melted in it. Thus we ſee that in our Glaſs-Houſes they are obliged to add triturated Marble to mix with thoſe fix'd Salts that are in the Aſhes to promote a Fuſion, and if we ſee Bricks diſſolve or vitrify without ſuch an Aid, it is becauſe the Particles of Lime are penetrating enough to ſupply the Place of Salts.

But when we uſe a ſubtle Fire, whoſe Vigour and Force is united in one Point of Direction, ſuch as the Rays of the Sun, when collected, ſupply us with, then there is no Body, but without other Aſſiſtance, muſt yield to a Vitrification, that is to ſay, muſt melt, congeal when it loſes its Heat, and remain hard, brittle and tranſparent.

Matters thus ſtated, we are at a Loſs to what to compare the Force of our *Veſuvian* Fire. Certainly not to the Solar Rays, when collected in the Focus of a *Lentil*, for it muſt be acknowledg'd that our Fire is neither ſo penetrating nor ſo ſtrong; we can as little compare our Fire, with thoſe of a Glaſs-Houſe or a Lime-Kiln, ſince by the Experiment quoted in the third Chapter, the Fire of our *Volcano* vaſtly exceeds the moſt violent Fires we uſually employ, either from the inflammable Nature of the Minerals that ſerve as Fuel to thoſe natural Accenſions, or the Diſpoſition of our ſubterraneous Cavities, which by reverberating the Heat, increaſe it to the formidable Degree of Violence it aſſumes.

In our *Hypotheſis* it is of ſmall Signification to know, if, to melt the Maſſes it operates upon, our *Veſuvian* Fire requires the Aſſiſtance of Salts, ſuch as thoſe us'd in the Glaſs-Houſes to liquify their Materials. It is enough that we know the Cavities of our Mountain (like thoſe of other *Volcanos*) contain a Variety of Mineral Salts highly proper to occaſion a Fuſion of this Kind.

CHAP. V.

Of the Aſhes and Stones ejected by Veſuvius, *during the Rage of its Eruptions.*

TO illuſtrate our Subject we think proper in this Chapter to examine the Aſhes and Stones which our *Volcano* throws, and explain their Properties and Effects, which we have in the preceding Part but ſlightly touch'd upon.

It is a Thing with us a Point beyond Diſpute, that in all its Eruptions (even of the moſt favourable Sort) *Veſuvius* emits a great Quantity of Aſhes and Stones mingled with the Clouds of Smoke that iſſue from its Summit.

Theſe Aſhes fly confuſedly about, juſt as the Thickneſs and Violence of the Smoke bears them up, or carries them about, and when united are not to be diſtinguiſhed from each other: When the Smoke looſes its Force by diſſipating or ſpreading in the Air, the Aſhes begin to fall in Proportion to their Bigneſs, the groſſer Parts firſt, the ſmaller next, juſt by the ſame Rule of Gravitation that the Earth and Sand in a River obey the Rapidity of the Stream, the heavier Parts ſinking firſt, and ſo by Degrees, till the Water becomes clear and free from all Mixture.

Hence it proceeds, that the Roots or Skirts of our Mountain are all cover'd with Aſhes and Pebbles, which always accompany the feebleſt Eruptions of *Veſuvius*; but as in thoſe that are violent the Smoke iſſues with a terrible Impetuoſity, and in a vaſt Body, it is no longer Aſhes and ſmall Stones which it ejects, but rocky Maſſes and large, even whole Rocks enflam'd, which cover the Sides of the Mountain, at a greater or leſſer Diſtance from the Top, in Proportion to their Bigneſs and Weight, till the lighter Parts or Aſhes are often ſpread and laid down at an incredible Diſtance.

In this Manner we muſt judge of what is recorded by both antient and modern Writers, who ſpeak of the Aſhes of *Veſuvius* as falling in Provinces and Places very remote from *Naples*, as *Dalmatia*, the *Adriatick Gulph*, and even as far as *Syria*, *Ægypt*, and *Conſtantinople* (*a*).

With Regard to ſo extenſive a Diſſemination of our *Veſuvian* Aſhes we muſt conſider theſe three Things.

1. That the Whirlwind of Smoke that iſſues from our *Volcano* obeys the Impulſe of the Wind, ſo that according to the Direction of the *latter* the *former* is carry'd towards ſuch and ſuch Parts of the Compaſs. Thus as in our laſt Eruption the Winds were much, or moſtly, in the S. W. Points, the Inundation of Aſhes fell on thoſe Places chiefly that lay to the N. of the

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(*a*) See *Dion* and other Writers.

the Mountain, ſuch as *Nola*, *Somma*, and the adjacent Territory; while the *Terra del Annonciada*, the *Greek Tower*, *Reſina*, *Portici*, and the neighbouring Villages, tho' much nearer the *Volcano*, continued exempt from this fatal Inundation; towards the End of the Eruption, as the Wind then changed, theſe Places felt their Share of the Calamity.

2. A Thing worthy of Remark is, that in all our Eruptions, either antient or modern, the Places to the N. and E. of *Veſuvius* have always ſuffer'd moſt, principally the former, which, no Doubt proceeded from this, that the Winds at thoſe Times were generally between the S. and W. Points, or not much diſtant from theſe. Thus we hear of our Aſhes being carried as far as *Syria*, *Ægypt*, and *Conſtantinople*, all lying to the N. and E. of *Veſuvius*; whereas *Dion* ſcarcely ſpeaks of the Aſhes that fell in *Rome*, in the Eruption that happen'd under *Titus*, which agrees with *Pliny*'s *(b)* Teſtimony of

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(b) Ep. xx. lib. 6.

that vaſt Cloud of Smoke that darken'd Cape *Miſeno*, the Iſle of *Caprea*, and other Places ſituated to the N. W. of our *Volcano*.

We muſt own, however, that in the vaſt Storm of Aſhes and Smoke that clouded *Naples* in the Eruption of 1707, the Fury of the Shower fell more on the Weſtern Side than the Eaſtern; but generally ſpeaking, the contrary happens, and the Southerly Winds avert the Miſchief from our Capital.

3. We imagine (tho' moſt Hiſtorians ſeem to be of a different Opinion) that theſe vaſt Showers of our *Veſuvian* Cinders or Aſhes at ſuch remote Diſtances, rather proceed from the Violence of the Wind, than the Rage of the *Volcano*; for let the Eruption be as furious as it will, if the Weather be calm, or the Winds gentle, the Aſhes will certainly fall near the Skirts of the Mountain, ſince they can be carry'd only as far as the firſt Impulſion of the Smoke, whether that be owing to the Violence of the Flames, or

of the Air that is pent in the Cavities of the *Volcano.* When we therefore read of our *Veſuvian* Showers extending to *Conſtantinople* or *Ægypt*, we ought to conclude the Winds were at thoſe Times violent and laſting from the oppoſite Quarter.

So diſtant a Flight was no Proof of the Fierceneſs of the Eruption, for even tho' the Aſhes ſhould be ejected in vaſt Quantity, tho' the Volcano ſhould yield new Supplies, it is ſcarce to be imagin'd by what Force theſe Aſhes ſhould be borne thro' the Air to ſuch an inconceivable Diſtance, ſince Experience ſhows us that the Duſt, even driven by a Storm, ſettles upon the Ground from whence it is raiſed; ſo that to ſuppoſe the Interval between *Naples* and *Conſtantinople* cover'd with a Track of our *Veſuvian* Aſhes, we muſt ſuppoſe an incredible Quantity to be ejected indeed.

How then ſhall we prove that the Aſhes of the ſame Eruption have endamaged Places oppoſite to each other in Situation?

This Phenomenon, which appears ſurpriſing, proceeds from ſeveral Cauſes. 1. In a few Days the Wind may greatly vary to different Points of the Compaſs, as happen'd in our laſt Eruption, tho' it continued no very long Time. 2. When our Aſhes have been carried to ſuch a Side by ſuch a Wind, a contrary Wind, by a different Direction, may change their Courſe. Thus the Aſhes borne to *Syria*, meeting there a North Wind, might be driven to *Ægypt*.

If this Matter then depends on the Uncertainty of the Winds, their Strength muſt no Doubt greatly contribute to the Quickneſs of the Paſſage of our *Veſuvian* Aſhes. In 1631, by the Teſtimony of *P. Recupito*, theſe Showers fell at *Locci* and *Bari* on the *Adriatic* Sea, eight Hours after the Eruption.

Dion, on the contrary, tells us, that the Aſhes fell at *Rome*, in the Reign of *Titus*, ſome Days after the Beginning of the Eruption, tho' before the News of it had reach'd that Capital of the World. As to this it is not improbable that in that Time the Wind had alter'd, for in that Caſe it only carry'd to *Rome*, the Shower that was already directed to ſome other Part, otherwiſe it could not take up ſo much Time for the Aſhes to go in a direct Line from *Naples* to *Rome*. Our Conjecture is the more probable as it is certain, that if the Winds be not high to a great Degree, our Aſhes cannot ſupport themſelves long in the Air.

There is indeed another Reaſon that ſeems to account for the Velocity of our Showers, and that is their glutinous Nature, and the flat Figure of their Particles. It is a Maxim well known in Phyſics, that the more Bodies are diſpos'd ſo as to contain a ſmall Quantity of Matter in a large Superficies, they float the eaſier and lighter upon Liquids of leſs Gravity than their own. Now our Aſhes are either originally endued with this Quality, or they acquire it by adhering to each other, by Means of the unctuous Humour with which they are impregnated.

To know how our Aſhes aſſume ſo violent a Force, and to diſcover of what they are form'd, we need only conſult *Borelli*, who explains this Matter at large in his *Meteorology* of Mount *Ætna*, which we have had before Occaſion to quote.

1. 'He ſuppoſes that preceding E-'ruptions always leave a great Quan-'tity of Aſhes and Cinders in the Ori-'fice or Mouth of the *Volcano*, ſo that 'the Paſſage of the Flames is in ſome 'Meaſure obſtructed. Now the Force 'of a new Eruption always hurries 'theſe up into the Air to clear is Paſ-'ſage.

2. 'He thinks, that in the univer-'ſal Shock the Mountain undergoes on 'this Occaſion, the Stones that fall 'from its internal Cavities, breaking 'upon each other, form a new Supply 'of Stones and Aſhes to the Eruption.

3. 'He is of Opinion, that ſome 'Part of the Fluid Mater is ejected in 'the Air like ſmall Rain, juſt as we

'ſee the Spray of the Surge that beats 'againſt the Rocks on the Sea-Shore, 'and riſes in white Duſts. This congealing in the Air, forms a new Addition of Aſhes and Gravel, or cinereal Powder, to the two former.

4. '*Borelli* conceives, that the Air 'itſelf has a great Share in this Phenomenon, and propoſes ſeveral ingenious Methods of accounting for the 'vaſt Diſtances to which the Aſhes of '*Ætna* are related to have been carry'd in different Eruptions.'

Theſe Sentiments of *Borelli* furniſh us with two Reflections. 1. We find, that our *Veſuvian* Aſhes are not compos'd of Matters newly inflam'd by the Eruption, but the greateſt Part of them proceed from the interior Cruſt of the *Volcano*, torn off and pulveriſed by ſome of the Cauſes *Borelli* mentions. Our Reaſon is, that theſe Aſhes are all fat with Bitumen, or impregnated with an oily Humour, which is a Point obſerved by all who have wrote the Natural Hiſtory of *Veſu-*

Veſuvius (*c*). Now it is incredible that a Fire violent enough to vitrify Sand and Stone, ſhould leave them the leaſt Unctuoſity, a Quality it would always deſtroy. But it is eaſy to conceive, that Stones and Aſhes which imbib'd this Quality during the Repoſe of the *Volcano*, ſhould be ſo ſuddenly ejected by the Eruption as to preſerve their bituminous Varniſh.

2. Our ſecond Obſervation relates to the Cauſe of the Ejection of our *Veſuvian* Showers. Beſides thoſe hinted at by *Borelli*, we find one mention'd by *Dion*, which ſeems natural enough, that is the Duſt raiſed by thoſe Parts of the Inſide of the Mountain that tumble in, juſt as when a Houſe falls we ſee a Cloud of Duſt riſe from the Ruins, and darken the Air. These are the Words of the Hiſtorian (*d*), '*Veſuvius* alſo throws out Aſhes when 'any Portions of its Cavity fall in Ruin.'

(*c*) See *Macrino* chap. viii. p. 70. & chap. x. p. 91.

(*d*) *Ad hoc & cinerem nonnunquam projecit, quoties ſimul aliquid ſubſidit.*

We now come to relate the Effects of thoſe Showers of Aſhes thrown out by our *Veſuvius* in the late Eruption, of which ſome were carry'd to the Extremities of the Kingdom. But the Places where they did moſt Damage were in the Neighbourhood of the Mountain, chiefly the Territories or Diſtricts of *Somma*, *Ottajano*, and *Nola*. The Readers will better judge of this by the following Report of ſome Members of our Academy, who viſited thoſe Places the 10th and 11th of *June*, in order to make their Obſervations.

About 100 Paces on the Side of *Somma* next *Naples*, or there-abouts, they found all the Grounds, contiguous to the Roads, cover'd with Aſhes. In entring the Village itſelf, it appear'd quite brown, by thoſe Cinders that cover'd the Houſes, for the Rain that fell had turn'd them to a viſcous Paſte, that ſtuck to the Roofs and Walls, like the Tallow melted to the Sides of a Candle. Nothing could be ſeen undiſguiſed, not even the Pavements; all was loſt in one Bed of Gravel, Sand and Aſhes, but not a Houſe was deſtroyed. The neighbouring Fields were all levell'd beneath the ſame Bed of Aſhes, which being ſoft, broke into Pieces, whenever it was ſtruck.

Theſe Aſhes every where compos'd a *Stratum*, beneath which lay another of Gravel, but they were not of equal Thickneſs every where, their Depth increaſing in Proportion, as you approached the Roots of the Mountain, at the Foot of which they roſe ſeveral Feet in Height, for the Plants and Shrubs were totally buried, and in ſome Places, the tops of the talleſt Trees were but juſt to be diſcerned.

In the Plain itſelf the Graſs was wholly loſt beneath the Maſs of Aſhes and Gravel, and what we remark'd of the Corn, which was greatly beat down, was, that the ſtrongeſt Stalks, which remain'd leaſt damag'd by the Storm, always inclin'd bent to the Part oppoſite to the Mountain, which proves, the Aſhes in their Fall kept an oblique Direction, as the Impulſe of the Wind really drove them.

In moſt Places we found the Leaves of the Trees ſhrunk up, and when rubb'd between the Fingers, they went to Powder. The Fruit was much in the ſame Condition, except, that the the Sides which lay moſt expoſed to the Force of this fiery Storm of hot Aſhes, were more blaſted than the other Parts. The Tops of the ſtrongeſt Trees ſuffer'd equally with the tendereſt Shrubs. In effect, ſoon after the Buds and young Leaves began to ſprout from the lowermoſt Branches, the Tops being dead beyond Recovery.

We remark'd that the greateſt Damage was occaſion'd by the finer Part of the Aſhes and increaſed by theRain, which turning theſe into a Kind of glutinous Paſte, ſtuck ſo cloſely to the Fruits and Leaves as to ruin them entirely, whereas the Gravel and ſmall Stones falling to the Ground, had not Time to do ſo great Miſchief.

The Trees that ſuffer'd moſt, were

the Apple, Pear and Plumb Trees; next the Poplar, the Fig Tree and the Vines. The Olive and Orange Trees eſcaped much better, but their wither'd and burnt Tops ſhew'd the Malignity of the general Calamity.

With Regard to the Service Trees they were little hurt; their Strength, or rather the Figure and Situation of their Foliage, had ſhelter'd them from the Rage of the Storm: The Ivy alſo was ſafe for the ſame Reaſon, as alſo becauſe the Trees and Houſes that propp'd it, gave its Verdure a Shelter from the Danger.

No Method was ſo effectual to recover the Trees that ſuffered, as to cleanſe the Aſhes from the Roots, and gently ſhake off thoſe that lay on the Leaves and Branches. For want of this timely Aſſiſtance, Trees that ſeemed to look the leaſt hurt by the Storm, dy'd in a ſhort Time. The Poplars only, which all thought loſt, flouriſh'd again in a little Space, contrary to Expectation.

While the Grain and Fruits thus

ſuffer'd by the Calamity, Animals themſelves did not eſcape their Share in the Diſtreſs. The Cattle ſuffer'd greatly for want of Paſturage, the Ground being all cover'd; of the weaker Sort, many periſh'd in the Storm. Birds of all Sorts were to be ſeen dying, or dead. Serpents, Lizards, and thoſe of the reptile Kind, periſh'd where-ever they were expoſed to its Rage.

Two Men were killed in the Neighbourhood of *Somma*, both Peaſants, the one middle aged, the other young; they had each got on a Mulberry Tree, to gather Leaves for their Silk Worms, when a Shower of our Aſhes ſurpriſed them, and tumbled them ſenſeleſs on the Ground. The Fall was ſo peſtilent that they dy'd in a few Days. This Effect of our *Veſuvian* Showers deſerves Notice; they ſtupify whoever is expoſed to them in the open Air.

The Wells and Springs that were cover'd up received no Damage, but where-ever our Aſhes fell into Ciſterns, or Water expoſ'd, it contracted a bad Taſte, which laſted ſome Days, but produced no ill Conſequences.

In the Diſtrict of *Ottajano*, the Tempeſt was terrible, for the Quantity of Gravel and even large Stones that fell was ſo great, that in ſome Places it lay four or five Palms deep, or upwards. Under ſuch a Shock, the Roofs of ſeveral Houſes fell in. Three Nuns were ſmother'd beneath the Ruins of their Convent, and a fourth had her Legs broke.

The Trees near this Village however ſuffer'd leſs than at *Somma*: The Reaſon of this was, becauſe they had been ſtripp'd of their Leaves by a Shower of Gravel, like Hail, which preceded that of Aſhes; ſo that the latter finding no Place to ſettle on, fell to the Ground, without doing much Harm. But the Ground remain'd ſo overcharged with the Burthen, that it ſeem'd to require both great Labour, and long Time to clear it for Cultivation.

In the Neighbourhood of *Nola* we

found Things on the ſame Footing, but no Houſes demoliſhed. The Glaſs of the Windows however were all broke to Pieces where-ever they lay expoſed to the Storm, juſt as happen'd at *Somma* and *Ottajano*, where none eſcap'd whole but ſuch as were ſheltered either by their Situation, or ſcreen'd by the Care of their Owners.

About two Miles beyond *Nola*, the Traces of the Storm began to decreaſe; but before we finiſh this Relation, we ſhall add, that the Fruits in general, and particularly the Cherries, which were touched by the Aſhes, became dangerous to thoſe who taſted them, occaſioning Diarrhœas and even inflammatory Fevers.

We ſhall now make ſome Remarks on the larger Stones ejected by *Veſuvius* in the Rage of its Eruptions. After what we have obſerv'd of its Aſhes and Gravel, the Reader will eaſily conceive how the larger Maſſes are thrown into the Air, how the Diſtance at which they fall on the Sides of the Mountain, is proportioned to their Weight and Figure, and alſo in what Manner they are formed.

That theſe Stones are not original Subſtances formed in the Cavities of the Mountain, but rather Concretions ariſing from Maſſes formerly melted down and lodg'd in the Cavities of the *Volcano*, is pretty evident. *Vitruvius* ſeemed perſuaded of this, in an Age much leſs enlighten'd by Philoſophical Obſervations than our own. Speaking of the Pumices found in the Neighbourhood of *Pompeii*, near *Veſuvius*, he deſcribes them as Stones calcinated by the Violence of the Fire. (*e*) His Words are, *The porous Spunges that we call the Pumice of* Pompeii, *ſeemed to me nothing but Concretions of Rock Stone, which have been by Heat metamorphoſed into this Shape.*

Hence we find, that even in the Age of *Vitruvius* they gave the Epithet of Spongeous to our *Veſuvian* Stones,

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(*e*) Ideoque quæ nunc Spongia, ſive Pumex Pompeianus vocatur, excoctus ex alio lapide in hanc redactus eſſe videtur generis qualitatem. *Vitruv. Lib.* ii. *Cap.* 6.

Stones, and not without Cauſe, for they are perforated thro' all their Subſtance like a *Spunge*, from which they differ only in Hardneſs, Colour and Weight, otherwiſe they might paſs for real *Sponges*.

Our *Architects* highly value theſe perforated Stones for the building of Vaults or Arches, not only on account of their Lightneſs, but becauſe they cloſely receive the Mortar, two Points that greatly contribute to the Solidity of Architecture. It is on this *Vitruvius* founds the Praiſes he gives (in the Paſſage above quoted) to the *Veſuvian* Stones and the Mortar of *Puzzoli* for their great Uſefulneſs in the Perfection and Strength of Architecture.

However the Stones projected from the Boſom of our *Volcano* are not all alike; they often differ as to their Ponderoſity, Colour, and Grain. This Variety may either proceed from the Inequality of the Fire that liquify'd them, or the heterogeneous Nature of the Particles that form this or that Stone.

There is yet another Difference; ſome Stones appear to be ſo far from any Concretion of a fiery Fluid, that they rather reſemble Rocks or Flints originally torn from the Cavities of the Mountains; at leaſt we may venture to aſſert, that they have by Length of Time loſt all Marks of Calcination, and by their Hardneſs, Colour and Smoothneſs ſeem quite different from the Subſtance of our *Lavangi.*

Amidſt the great Variety of Stones that cover the Sides of our *Volcano,* we find ſome of a middle Conſiſtence, that is, neither quite porous, nor of a cloſe Grain. When pounded or triturated, they compoſe a blackiſh Powder, lucid, ſhining, and tranſparent, as is diſcovered by the Microſcope.

This gives us ſome Light in diſcovering the Nature of that dark and lucid Sand found on the Shores of *Prochyta* and *Iſchia*, with which we uſe to dry our Writing, which nearly reſembles that which Mr *Geoffroy* found in the *Campana di Roma.*

We incline to think then, that this Sand is nothing but the Duſt of our Stones juſt mentioned, worn off by Time, or rather the Stones themſelves, reduced by the Air and Length of Age to this State. The Agitation of the Winds and the Waves have contributed to this, and we infer from hence, that where-ever this Sand is found, the Earth and Stones have formerly felt the Force of ſubterraneous Fires. Our Countryman, *Tho. Cornelio*, was of this Opinion, for ſpeaking of our *Iſchian* Sand, he ſays, that Iſland was once diſturbed with Natural Conflagrations, as well as the neighbouring ones of *Iſchia* and *Prochyta*, which both abound with Sand of this Sort.

Mr *Geoffroy*, and the noble *Pietro Antonio Micheli* are of the ſame Sentiment (*f*). The latter found this Sort of Sand, with ſome other Stones of this Sort, on Mount *Radicoſani* in *Tuſcany*, and from thence concludes there

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(*f*) *See his Elogium printed at* Florence *in* 1737. p. 19. *See alſo* Opuſcula Philoſophica, *Lectio ii.* Super Terræ Motum. *p* 45.

there was once a Volcano in that Place, tho' the Memory of it is loſt. We know not how the Abbe *Bourdelot* came to aſſert (*g*), that this Sand, which the *Jews* ſell at *Rome*, was only triturated common Glaſs, which, by Length of Time, appear'd in this Manner. Undoubtedly it is the Duſt of Stones once vitrify'd in our Volcanos. Our own Obſervations, and the Authority of the beſt Naturaliſts, put the Matter beyond Diſpute.

(*c*) Bourdelot Recherches & Obſervations Naturelles. *Let. viii: p.* 71.

CHAP. VI.

Of the Moffetti, *or Peſtilential Exhalations cauſed by the Eruption of* Veſuvius.

IF the Term of *Moffetto* ſeems new any where, it is well underſtood at *Naples*. The learned *Leonardo di Capua* has left a Treatiſe that fully explains this Subject. Even our common People are no Strangers to the Nature of this Steam, as we have ſcarce any one who has not ſeen or heard of the celebrated *Grotto di Cani* on the Banks of the Lake of *Agnano*, between *Naples* and *Puzzoli* (*a*).

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(*a*) See a large and particular Account of this Grotto in Mr *Addiſon*'s Travels, and *Miſſon*'s Voyage into *Italy*.

On bringing a Dog into this little Cave they hold his Head down below the Surface of the Exhalation, and immediately perceive him pant and breathe like Animals that want a free Reſpiration. In a ſhort Time he looſes his Senſes, and, if not ſpeedily taken out, he expires in a few Minutes, foaming at the Mouth with ſtrong Convulſions. While a Man ſtands up in the Grotto he breathes freely enough, but hold down his Head within the Sphere of the Exhalation, he feels the ſame Effects. In ſhort, all Animals here find a ſpeedier or ſlower Fate, in Proportion to the Conſtruction of their Organs, and the Strength of their Conſtitution.

Such is what we call a *Moffetto*, of which we have others in the Neighbourhood of *Naples*, and in different Parts of the Kingdom. Nor do other Countries want them, * witneſs *Leonardo di Capua*, who cites the Teſti-

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* Of this Kind undoubtedly are the Damps in Mines and Coal Pits.

mony of ſeveral Geographers to this Purpoſe (*b*).

The Lake of *Averno* might antiently paſs for a Kind of *Moffetto*, for the *Grecks* gave it the Name of *Aorne*, becauſe its Exhalations were ſo peſtilential as to kill the Birds that accidentally flew acroſs it (*c*).

Let us now give a more particular Deſcription of our *Moffetti*, that the Readers may better judge of the Nature of theſe peſtilential Exhalations or Vapours. We call then a *Moffetto*, 'A 'Steam which is deadly to all Animals 'that remain in it, that extinguiſhes 'the Flame ſuddenly, not by its 'Stench, nor Coldneſs, nor Heat, nor 'any viſible or apparent Quality, but 'from ſome occult Cauſe which our 'Senſes cannot diſcover.'

We ſay that this Vapour extinguiſhes the Flame, for you no ſooner let down a lighted Torch or Candle into its Atmoſphere,

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(*b*) *Vid. Leonardo di Capua Introd. al Lettioni ſopra gli Moffetti.*

(*c*) *Aorne* ſignifies a Place without Birds, or which the Birds ſhun, or dare not paſs without Danger.

moſphere, than it goes out as ſuddenly as if plung'd in Water.

According to the Opinion of Naturaliſts, theſe *Moffetti* are uſually found in Mines or Places where mineral Subſtances abound in the Cavities of the Earth. Hence they are always to be met with in the Neighbourhood of *Volcanos*, and particularly of our *Veſuvius*, of which we have ſufficient Proofs.

Theſe Exhalations we may divide into two Claſſes. 1. Thoſe that in the ſame Degree of Extenſion preſerve their Efficacy, and are of a laſting Nature. 2. Thoſe that riſing accidentally from the Earth, evaporate their Malignancy in the Air, and conſequently are of no long Continuance.

In this ſecond Claſs we range thoſe Damps that ſometimes prove fatal to Miners in their Work, if they do not ſpeedily get out of the Danger; but when the Exhalation evaporates, the Miſchief is over, and the Labourers return with Safety. Inſtances of this are frequent about *Naples*, as *Cornelio* has obſerved at large (*d*). But not to exceed our Bounds, we ſhall ſay nothing of a third Kind of Exhalations, which we may call artificial *Moffetti*, ſuch as the Steam of new Wine when in the Fat, that of ſeveral Chymical Mixtures, the Steam or Smell of Charcoal, or ſulphureous Coal, and, laſtly, the Nuſance of Air, when long pent up in the ſame Compaſs.

We return then to the firſt Claſs of our Exhalations, ſuch as are natural, and ſhall confine ourſelves to thoſe produced by our laſt Eruption; deſcribing their Effects, and adding our own Obſervations, without entering further into the Cauſes of ſo ſurprizing a Phenomenon, for which we refer our Reader to thoſe Writers who have treated more at large on the Subject.

Leonardo di Capua is far from explaining the Exhalations we deſign to enquire into, thoſe he treats of being ſuch as are found in our Wells, and in ſeveral Places where the Workmen dig at *Naples*, in the Suburb of *Lucullus*; whereas

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(*d*) In his *Progymnaſma de ſenſibus.*

whereas, during the Eruption, theſe *Moffetti* loſe much of their Force, as if the neighbouring Fire exhauſted their Virtue; now it is certain, thoſe we ſpeak of are very different, for upon an Eruption they diſcover themſelves in numberleſs Places of the Mountain, which never before were infeſted with ſuch Vapours.

That our Exhalations are real *Moffetti*, and of a very violent Kind, we are convinced by ſeveral Experiments, which we ſhall lay before the Reader. One Thing we ought to premiſe, that they did not appear along the Torrent thrown out by the late Eruption, but rather in thoſe Places where we ſee the Remains of the old Torrents in the Eruption of 1631.

We muſt not, however, miſtake for *Moffetti* the Steams of warm Smoke, which we ſee iſſued from our Torrent by ſeveral Funnels, while it is yet hot, and full of accenſible Minerals.

There is in this Caſe a material Difference; a real *Moffetto* is neither to be ſeen or ſmelt, but only diſcovers itſelf by the Malignity of its Effects. The Vapours of our Torrents, on the contrary, are viſible at a good Diſtance, have a ſtrong Smell, tho' no Way dangerous, ſo that many think them beneficial in weakly conſumptive Aſthmas, which their ſulphureous Particles, the Phyſicians think, may be of uſe to relieve.

Our Peaſants know a *Moffetto*, or peſtilential Exhalation, by ſeveral Marks; ſometimes the Graſs is violently agitated, chiefly in thoſe Places that ſerve as Vents to the Exhalation; ſometimes the Plants appear all dead and whither'd by the Malignity of its Venom; and ſometimes they know it by Birds, Lizards, and Inſects, which lie ſmother'd in its Courſe.

Our Exhalations were pretty viſible on the Brink of our Wells, for by looking attentively, provided there was any Light, we could diſcern a thin and almoſt imperceptible Vapour, a pale wav'd Smoke, whoſe Vibrations appeared ſhort and interrupted, not unlike that Sort of Steam that is emitted from ſrom a red hot Plate, which when expos'd to the Sun, is juſt to be perceived.

Our *Moffetti* were to be ſound in all our Wells and Cellars, no Part was free but thoſe where the Remains of our antient Lavangi were not to be found; nor even there did they pierce through the Earth when it was cloſe, or when the Maſs of the Torrent was perfectly conſolidated and firm, (*d*) but they made their Way quickly thro' the broken Parts of the Torrent, which ſerved as Vents for the Vapour to exhale in the Air. Theſe Vents were larger in ſome of our Exhalations than in others.

Near the largeſt of theſe ſuch as that of *Pugliano*, behind the Church of St *Maria*, and another at a Place called *Trentola*, by the Side of the Road, the Current of the Exhalation was very perceivable, not only by the Motion of the Graſs and Herbs, but by putting the Hand or Foot near its Spring, you

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(*d*) *Leonardo di Capua* is of a different Opinion.

you felt it like a ſmart Breeze of Wind.

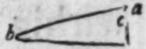
In each *Moffetto* we obſerved the Vapour ſtill run on a Declivity, juſt like any other fluid or liquid Body: For this Reaſon when the Exhalation roſe from the Bottom of a Well, which had been dug in an antient Torrent, it firſt ſettled on the Water, ſwelling till it had gained the Brink, from whence it ſpread abroad and was preſently loſt.

This Obſervation is confirmed by the following Experiment: In a Well infeſted with one of our *Moffetti*, there was a Window that communicated with a Cellar, lower than the Well itſelf. This Window was ſome Feet above the Surface of the Water, and at about the ſame Diſtance from the Mouth of the Well. Check'd by this Situation, the Exhalation could never gain the Brink of the Well, but paſſed through the Window into the Cellar, where it ſoon ſpent its Force.

This Inclination in our Vapours to deſcend, is proved by another Experiment.

ment. The *Moffetto* before-mentioned at *Pugliano*, extended, ſkimming the Earth, ten or twelve Paces. We try'd it this Length with a lighted Torch, and we found it had loſt its Force on the firſt level Ground, by the Torch keeping its Flame, but in ſome Trenches adjacent, tho' not a Yard deep, we found it had lodged itſelf, extinguiſhing the Flame, and killing ſome Birds which we put down within its Atmoſphere.

We ſhall now make, from theſe Experiments, a natural Reflexion. When a River ſwells above its Banks, the Water it leaves in the Plains quickly runs off, either by the Declivities of the Ground, or is dry'd up by the Wind, ſo that the Ground is ſoon dry except what Water remains in the Ditches and Hollows. Juſt ſo when our *Moffetto* at *Pugliano* roſe from its Spring, the Air ſoon diſſipated that Part of it that covered the Earth, but the Vapours that remained in the Trenches ſtill kept their Force a conſiderable Time.

We muſt however admit this Rule of the Deſcent of our Exhalations with ſome Reſtriction; for they are not ſo ſpecifically heavy as to follow the Deſcent of the Ground exactly, like Water and other heavy Fluids. They differ ſo that when one of them riſes a Foot or two above the Top of a Well, or higher, it does not deſcend again in a perpendicular Direction, but in an oblique Line, between an horrizontal and perpendicular Line, thus 

This we had confirm'd by Experiment, a Torch extinguiſhing in the Line *a b*, and remaining untouch'd at *c*, the Bottom of the Wall of the Well.

By the Help of the preceding Obſervation we may conceive, that round the Well the Exhalation left a triangular Space, beneath its oblique Direction, uninfeſted; this Space had three Sides, one perpendicular, form'd by the outward Wall of the Well; the ſecond, horizontal, form'd by the Ground, and the third, oblique, made by the Deſcent of the Vapour.

We found our *Moffetti* obey the Impulſe of the Winds, and change their Courſe by their Direction. This we remark'd in ſeveral Places. Hence it happen'd, that a Torch kept its Light in a Space of Ground where an Exhalation of this Sort, riſing from a Well, extinguiſhed another Torch, only becauſe the Wind drove it a different Way; and, for the ſame Reaſon, the Well was to be approach'd with leſs Danger on that Side than the other.

The Quality of the Air had alſo an Influence on theſe Exhalations; when the Air was ſtill and calm, the Vapour kept its Body, and was much more peſtilential than at other Times. For this Reaſon our *Moffetti* were moſt dangerous during the Night, and in the Mornings and Evenings. We obſerved the North Wind increas'd their Violence, but when the Sun broke out, and the Southerly Wind blew, they loſt, in a great meaſure, their Strength.

In general, when theſe Exhalations met with a free and open Air, expos'd to the Winds, they grew weak, and ſoon were diſſipated. But in Cellars, Wells, and other cloſe Places, the Caſe was quite different. In the Vallies, eſpecially, theſe Vapours often cover'd a Tract of Ground, without abating in the leaſt their Malignity.

If we can truſt our Feeling, our violent *Moffetti* are ſenſibly cold to the Touch. This Quality is confirmed by the falling of the Thermometer to a ſenſible Degree, when let down within their Atmoſphere; we could not, however, accurately aſcertain the Degree of Cold, for tho' we repeated the Experiment, yet, as the Sun was hot, the Liquor we found fell, when the Inſtrument was placed in the Shade, whether in a Place infeſted by the Vapour or not. On the contrary, when the Exhalation lay expoſed to the Sun, it loſt its Coldneſs, ſo that our Experiment could not be made in either Caſe with the Certainty deſired.

Curious to know if this Exhalation would have any Effect on the Barometer, we placed one in the Stream of one of our moſt violent *Moffetti, and it gave not the leaſt Sign of Alteration,* tho' we repeated the Experiment twice without Succeſs. A Bladder well ty'd, half-fill'd with Air, was alſo try'd, but diſcover'd no Change, nor Sign of Emotion.

As far as we could judge, our *Moffetti* have no Moiſture in them; one thing certain is, that the Hygrometer gave no Signs of either Humidity or Dryneſs. That their Exhalations are fatal to Men and Beaſts, we know from repeated Inſtances. An *Auguſtin* Friar going careleſsly into a Cellar of the Convent, was inſtantly killed by the Malignity of the Vapour; and another had met with the ſame Fate, if he had not been quickly ſuccour'd and drawn out. An old Man fainted away in a Valley, infeſted with ſuch an Exhalation; he was quickly carried home half dead, and with Difficulty recovered. Nor are thoſe Vapours only deadly to ſmall Animals ſuch as Lizards, Rats, Birds, but to larger Animals, ſeveral Sheep and Goats ſurprized in the Current of a *Moffetti*, fell ſtupified, and in that Situation ſoon expired; nor did the Fruits of the Earth eſcape their Rage, Plants, Vines, Poplars, Fig-trees and others felt their Malignity; ſome withering, others dying, either as the Vapours had affected the Roots or Branches. It is well known at *Naples*, that in the Neighbourhood of *Veſuvius* our Trees are uſually planted on the Remains of the old Torrents, which are dug up for that End. Now as theſe are moſt ſubject to theſe pernicious Vapours, no Wonder if the Trees had ſo great a Share in the Calamity.

The Wells of *Portici* are almoſt all ſunk in the ſame Bed, ſo that the Waters of this Village were generally infected by the Exhalation. They had a diſagreeable bitter Taſte, and not only Men avoided drinking them, but even the Cattle and Horſes refuſed to taſte them.

We know not indeed whether this Water would have been deadly or unwholſome, but we have Ground to conclude in the Negative. 1. Becauſe the Plants water'd by it never ſuffer'd the leaſt Damage. 2. Becauſe it is not certain that an Exhalation peſtilential in itſelf, ſhould be as fatal when mix'd with other Bodies and taken in Food. We find ſeveral Simples in their Nature poiſonous, become uſeful in compound Medicines: Add to this, that we know at *Rennes* a Well infected by a violent *Moffetti*, (*e*) whoſe Water is uſed without any Prejudice.

No ſooner was the Malignity of theſe Exhalations known at *Naples*, but the Populace took the Alarm, dreading a Peſtilence from the Infection of the Air. His Majeſty therefore, always attentive to the Safety and Repoſe of his Subjects, reſolved to be ſatisfied if ſuch Apprehenſions were well-grounded. The Deputies of Health had Orders, aſſiſted by the Phyſicians, to examine the Nature of theſe Exhalations, and make a faithful Report. Two Members of our

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(*e*) *Hiſt. de l'Academie de Sciences* 1701.

Academy had the Honour to be join'd in this Commiſſion. (*f*)

In conſequence of this, ſeveral Obſervations were made and carefully compared with the Teſtimony of the moſt underſtanding Peaſants. The Reſult of the Inquiry was, that theſe Exhalations hurted none, provided they kept out of their Atmoſphere. A Month had now paſſed without Danger, which was enough to calm the general Inquietude; the Popular Fears at length abated, and the Publick reſum'd its Tranquillity as theſe Vapours daily decreaſed and in a ſhort Time were totally diſſipated.

We ſhall conclude this Chapter with ſome Obſervations and Experiments made on the Subject. The Method we took to diſcover their Courſe and Extent, was by lighted Torches we carried with us; theſe when held in the Atmoſphere of a *Moffetti* inſtantly went out, and the Smoke pointed the Direction of the Exhalation.

Aſſur'd

(*f*) *Leonardo di Capua* believes no Infection of the Air is to be dreaded from our *Moffetti*.

Aſſur'd by this Means that in thoſe Places our Vapour exiſted, we put down Hens, Pidgeons and other Birds within its Atmoſphere. They ſhew'd their Senſe of the Danger by ſtruggling violently to eſcape; at the End of two Minutes they loſt all Senſe and ſeem'd to reſign themſelves to their Fate, but being drawn out and laid in the free Air, by Degrees they reviv'd and grew preſently well as ever, (*g*) whereas if continued in the Vapour, they expir'd generally in two Minutes more.

Such was the Effect of our Experiments on Birds; but two Pidgeons dy'd in a Minute in a Ditch, where was only the Remainder of a *Moffetti*, conſiderably weakened by its Courſe. On opening theſe different Birds, their Fleſh appear'd livid, and in their Gullet we found a Quantity of Flegm, or a ſerous glutinous Subſtance of that Kind.

Our

(*g*) *Leonardo di Capua* thinks, in order to recover theſe Animals, they ſhould be hung with the Head down, but we believe that is unneceſſary.

Our Experiments on Dogs had the ſame Succeſs, only that they dy'd with more Difficulty. We placed one at he Spring of the violent *Moffetti* at *Trentola*: The Animal was ſtrong and middle-aged, we had ty'd his Feet, and held his Mouth oppoſite to the Current of the Exhalation. In about a Minute and Half he fell into a Stupefaction, ſo that he lay without being held down: He breath'd hard and ſnor'd violently, his Urine eſcaped twice from him, and after ſeven Minutes and a half of tormenting Convulſions he expir'd.

On diſſecting him we found his Fleſh livid, like that of an Animal ſome Days dead: His Lungs were ſoft and lax, and the Ventricles of the Heart quite empty, but the Veins turgid and full. He had voided at the Mouth a great deal of Slaver, but without (*h*) Froth; we judge he muſt have ex-

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(*h*) We ſhall here make a Remark, for which *Leonardo di Capua* gives us a Handle. He accuſes *Campanella* of a Miſtake, becauſe the latter aſſerts, that Animals plac'd in the Current of a *Moffetti* throw out expired within ſour Minutes, for at the End of the ſecond, his Reſpiration appear'd greatly diſturb'd, as well as the other Functions of the Body.

We made ſome Experiments on the Water tainted by our Exhalations, into which we put ſeveral Sorts of Fiſh. Undoubtedly they felt ſome Pain, for they darted about with ſurprizing Velocity and Signs of Uneaſineſs, often thruſting their Heads above the Surface, which they ſeldom do when the Element is pure. Eels and Frogs ſeem'd to bear it better, though at laſt they ſeem'd like the others to be quite ſpent, and lay on the Surface with their Bellies turn'd up as if dead: But whether the Water purged itſelf from the Contagion ſoon, or ſome other Cauſe, they all reviv'd (two or three Eels excepted) and being removed to clean Water, ſoon grew well as ever.

Some

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out Foam. Indeed, if we take this Foam to be a frothy Saliva, intermiz'd with Air, the Fact is fálſe; but that they throw up Slaver in great Quantities we are convinc'd by ocular Demonſtration.

Some Frogs newly ſpawned, notwithſtanding their tender Make, recover'd thus, tho' they had lain apparently dead in the infected Water for above an Hour's Time. Indeed when we made this Experiment, our Exhalations were much decreaſed in Strength, ſo that the Water had but a ſlight Tincture of the Infection.

Having, during theſe Experiments, conceiv'd a Doubt, whether this Infection penetrated the whole Maſs of the Water, or only floated on the Surface, we judg'd at laſt that as the Air deſcends into the Body of the Water, our Exhalations might do ſo too. The bad Taſte of the Water itſelf favour'd this Conjecture. Being thus perſwaded that the Wells which communicated with the Channels of our antient Torrents were only ſubject to this Contagion, we bethought ourſelves of a Method to prevent this Evil for the Future.

It was eaſy to ſee that the ſure Way to remedy the Diſorder was to cut off all Communication of this Sort, by lining all the Cavities of our Wells with a Coat of ſtrong *Stucco*, by which Means the Exhalation finding no Vent could do no Damage.

This is all we have been able to obſerve with reſpect to theſe peſtilential Vapours that attend the Eruptions of of our Volcano, and are of no long Continuance; as to thoſe of a permanent Sort, they are not the Subject of our Enquiry.

We own that *Dion* aſcribes the Peſtilence that happened in the Reign of *Titus*, to the Eruption of *Veſuvius* that preceded it; but we can ſee no Connexion between them: For it is ſcarce probable our Conflagrations could have carry'd the Infection to *Rome*, while *Naples* itſelf remained free. If this was really produc'd by that Cauſe, it muſt proceed from the Corruption of the Water and Fruits of the Earth, by the Showers of *Veſuvian* Aſhes that fell at that Time.

Villani (*h*) in ſpeaking of *Iſchia*, ſeems to ſay expreſsly, that both Men and Cattle died of that Peſtilence, which

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(*h*) *Villani Hiſt. Florent.* lib. viii. cap. 54.

which laſted two Months. Undoubtedly he means by the Word Peſtilence, the Infection of our Exhalations, the *Latin* Writers uſing the Word *Peſtis* or Peſtilence, to ſignify any publick or general Calamity.

As to the reſt, we are ſure theſe Exhalations are no new Thing. We have ſeveral *Neapolitans* living who can remember this Phenomenon always to attend the Conflagrations of our Volcano.

CHAP. VII.

Of the State of Veſuvius *ſince the laſt great Eruption.*

HAVING mentioned the former Changes which *Veſuvius* has undergone from different Eruptions, both as to its Figure and Bulk, we ſhall now deſcribe the Condition in which the laſt Conflagration has left it, by which Poſterity may the better judge of the Alterations it may ſuffer in ſucceeding Times.

It is a Loſs that we have no faithful or exact Deſcription of the State of our Volcano before its laſt Eruption; various Relations of this Kind have indeed been publiſh'd, but none of them ſeem to bear the Marks of Authenticity. One Thing we are certain of, and may be ſenſibly perceived, is, that before the Eruption, the Southern Summit of *Veſuvius*, from whence the Flames proceed, was both higher and more piked or ſharp than at preſent.

The Inſide of the Volcano, or its Gulph, has alſo changed its Aſpect, as appears from this, that the Smoke which continually exhales from thence is no longer united in one Body as formerly, when it proceeded from one Aperture, but is divided into five or ſix Streams ſpringing from ſo many Funnels ſeparate from each other, as may be eaſily ſeen before Sun-riſe, when the Air is clear and calm; and if the Smoke ſometimes whirls out as if from one Vent, it is owing to the Quantity of the Vapour, or to the Briskneſs of the Wind.

Thus much is viſible from *Naples*, but it is neceſſary to give the Reader a nearer View taken on the Spot, in which we obſerved the following Particulars.

1. The Perimeter or Circuit of the Baſe of *Veſuvius* in its utmoſt Extent, is near forty *Italian* Miles, but its neareſt Circuit, does not exceed thirty; we mean by the neareſt Circuit, the Place where it begins to riſe above the Plain.

2. The Height of the Northern Summit, meaſured from the Level of the Sea, is about 720 *Neapolitan* Canes, that of the Southern Point, or Volcano 646.

3. The new Aperture which is broke out on the Declivity of the Southern Summit, from whence iſſued the principal Torrent of Fire, is 552 Canes above the Water-level.

4. The two Summits are diſtant from each other at their Points 340 Canes, at their Baſe 150; that is to ſay, in the Place whence the two Diviſions of our Mountain riſe, called the *Val d'Atrio*, as may be ſeen in Plan I. at the End of the Work.

5. The Top of the Southern Summit is hollow, and preſents to the Eye

a Gulph of a circular Figure, whoſe largeſt Diameter, which we call its Baſon, lies from E. to W. and is 350 Canes over.

6. This Baſon or Cavity is edged with a Border or Bank, which projects to the Inſide, like a Precipice, and nearly reſembles the Banks of a River hanging over, whoſe Earth the Floods have carry'd away.

7. This Border is pretty equal round all the Gulph, only to the W. it is interrupted by the Advance of ſome Fragments of Rock exceeding hard, and which ſeem to be of the ſame Subſtance with the internal Matter of our *Lavangi.*

8. On the Eaſt Side where this Bank is ſmootheſt, is a ſloping Deſcent which leads to the Bottom of the Gulph, ſo that you may go down it tho' with much Difficulty.

9. All this Opening, ſuch as now deſcribed, is the Mouth of an Abyſs that pierces the Intrails of the Mountain in form of a truncated Cone, of

which the Circumference of the Opening makes the Baſe.

10. The Sides of this Baſon are all covered with Cynders towards the Eaſt, unleſs where ſome Pieces of Rock appear thro', near which lie ſeveral unperceived Vents, from whence exhales the Smoke; and about them are found various Concretions of Salts and Sulphur. This is the Side, which, we obſerved, afforded the eaſieſt Deſcent to the Bottom of the Baſon.

11. Towards the South, the Declivity appears much ſteeper, tho' naturally laid with great Ranges of Stone. The thickeſt Smoke ariſes from this Quarter, (at leaſt during the Time we made our Obſervations) which is without doubt the Cauſe that the mineral Salts and Sulphur are here found in greater Quantities than towards the Eaſtern Side.

12. On the W. and N. the Sides are almoſt perpendicular, form'd of vaſt Stones, ſome of which project out, and are as it were varniſh'd or coated over

with Sulphur, the Effect of the prodigious Smoke which iſſues on that Side.

13. The Bottom of the Baſon lengthens a little between the North and South, its ſmalleſt Breadth is about 50 Canes.

14. During our Obſervations on the Internal State of the Volcano, there was towards the South-ſide a ſmall Collection of Rain-Water, which covered near half the Bottom of the Baſon.

15. The Water was blackiſh and warm. It appeared frothy towards the Edges, and had a bad Taſte of Salt and Sulphur. Its Depth did not appear to exceed two Palms, or thereabouts, as we judg'd from ſeveral Stones we threw in.

16. This Lake of Rain-Water was cloſed on one Side by a Bank of Aſhes, on which we obſerv'd the Traces of ſeveral Streams that had run over into the empty Part of the Baſon, but were now loſt and dry'd up.

17. The dry Part of the Baſon appear'd extremely rough and uneven,

full of Holes and Breaks, and cover'd with Salts and yellowiſh Sulphur, ending like the Hollow of a Sea-Shell between the North and Weſt, and from this Cavity, which was deeper than the Lake, aroſe the thickeſt Smoke.

18. It was impoſſible for us to meaſure the Depth of this Part of the Baſon, for Want of a proper Place to fix the Inſtruments neceſſary for ſuch an Operation. Willing, however, to examine this Matter as well as the Situation of Things would permit, we took the following Method; we choſe that Part of the North Side of the Rock where the Precipice was ſteepeſt and leaſt interrupted, ſo that by caſting in Stones, from hence, we had Hopes they would meet with leaſt Obſtacles in the Deſcent. We threw very large Stones five or ſix Times, while Perſons, placed on the other Side the Baſon, meaſured the Time of their Fall by the beating of the Pulſe. The Pulſations each Time exceeded forty, ſo that taking each for a Second, and ſuppoſing the Stone to fall to the Bottom with the ſame De-

gree of Velocity, the Depth muſt be 84 Canes. But as the Man whoſe Pulſe we examin'd was much fatigu'd with climbing the Mountain, and as the Air was no doubt heated by the Quantity of hot and ſulphureous Vapours, as well as by the Weather, it being the Heat of Summer, no doubt the Pulſations were too quick for our Eſtimation of them at a Second each; on the other Hand, as we ſuppoſed the Degree of Velocity in the fall of the Stone to be equal, excluding the Acceleration of it, as well as the Obſtacles it might meet in the Deſcent, we believe our Calculation not far from Truth.

Such was the State of our *Volcano*, at the Time of our Examination of it (*a*). We ſhall however communicate to our Readers, our Opinion of this Lake, which, tho' the Rains had been great, yet in *September* it took up but the half of the Cavity of this Baſon.

We

(*a*) See the Plan No. II. at the End of this Volume, where the Volcano is ſhewn in Profile, and repreſented as we have deſcribed it above.

We think then, that from hence we may account for the Origine of thoſe Mineral Springs that abound at the Foot of our Mountain in different Places, and whoſe Waters are impregnated with a ſalutary Virtue.

By the former Meaſures we have computed, the Mouth of our *Volcano*, taken in Breadth and Length, to contain 6,160,000 ſquare Palms. Now the Rain that falls in the Territory of *Naples* for the Courſe of a Year, amounts to about three Palms in Depth (*b*). By this Computation it follows, that the Cavity or Baſon of *Veſuvius* receives about 18,480,000 cubic Palms of Rain Water (*c*) annually.

Now tho' we ſuppoſe a great Part of this Water evaporated by the ſubterranean Heat, yet we may gueſs there remains ſufficient to ſupply perpetually the

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(*b*) This Computation is founded on the Obſervations of M. *Cyrille*, a Member of our Academy, for ten Years together.

(*c*) We ſay *about* this Quantity, becauſe we doubt if the Quantity be ſo great, for at the Top of a Mountain the Rain falls always in leſs Quantity than on a Plain. This we know by the Convergence of the Drops in their Deſcent from the Clouds.

the Wells and Rivulets adjacent to the Foot of our Mountain. This Quantity is alſo decreaſed by what the Surface of *Veſuvius* drinks in, which falling or ſinking thro' its Cavities, forms a new Supply to our Springs beneath. (*d*)

We know this may ſeem to contradict what we have ſaid in the preceding Part, that our *Veſuvian* Aſhes will not admit the Rain; but we mean there ſuch as are new thrown out, and glutinous with Bitumen. This Unctuoſity wears off with Time, as Experience ſhews, ſo that it is no Wonder or Contradiction if our *Veſuvian* Surface admits Water.

Beſides this, our Mountain is full of Breaks and Crevices, by which the Rain eaſily penetrates thro' the ſame Channels that exhale the Smoke, and falls down thro' the Receſſes of the Mountain. Hence it is eaſy to judge that the Springs which riſe at its Foot become

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(*d*) This only relates to the preſent State of *Veſuvius*. Before the laſt Eruption the Caſe might have been different: One Thing certain is, that our Volcano, at all Times, was hollow enough to receive and contain a Quantity of Rain.

become impregnated deeply with ſeveral Minerals, eſpecially thoſe of the ſaline and ſulphureous Kind. Hence proceeds their diuretic Quality, and that they are gently purgative and ſoftening in ſeveral Indiſpoſitions; of this we have a remarkable Inſtance in the famous Baths of *Piſcarielli*, which riſe behind the *Solfatara* near the Lake of *Agnano*, and undoubtedly proceed from the Snow, and Rains which fall in the Cavities of our *Volcano*.

As the Baſon of *Veſuvius* is only a Plain ſunk in the Middle, the Water can find no iſſue but by paſſing through the Cavities of the *Solfatara*, where it takes a ſtrong Tincture of Sulphur and Alum, and ſprings out very hot at the Foot of one of thoſe Rocks that form the Baſis of our Mountain, as they undoubtedly did in the Time of *Strabo*, by his own Words. *(e)*

Amongſt the Changes produced by the laſt Eruption, we may reckon the Im-

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(e) Campus circumquaque incluſus ſuperciliis, &c.

Impediment of the high Road near the E. Side of the *Greek Tower*, for the Way is there yet interrupted by the vaſt Torrent which advanced near the Sea-ſide. A prodigious Bank was rais'd by it, which would have prevented all Paſſage, if our Labourers had not wrought to clear a Way thro' this *Veſuvian* Mound, and carry off the largeſt of the Stones; it is ſtill a little troubleſome to croſs the Remains. The reſt of our Torrents did little Damage, and have been ſufficiently treated of in the firſt Chapter.

We ſhould here put a Period to this Work, but the Mention of the *Greek Tower*, threatened by this fiery Inundation with Deſtruction, obliges us to add ſomething concerning the proper Methods of ſaving a Place that lies expos'd to the Fury of this fiery Calamity.

The Slowneſs and Fluidity of our Torrents ſuggeſt two Means of averting their Danger. The firſt is to raiſe ſtrong and ſufficient Ramparts of Earth or Stone againſt its Courſe, according as the Diſpoſition of the Ground, may direct it to the Place intended to be ſecur'd. This Method is very ſure, if theſe Walls be well lin'd with Earth, and, if the Time allows, will effectually check the Diſaſter.

2. The ſecond Method is more eaſy yet, and may be employ'd in thoſe Caſes, where the Courſe of the Torrent allows leſs Time, and that is to ſtop its Progreſs, by cutting large Trenches acroſs its Paſſage, or by ſome other Method that may alter its Direction, and point it a contrary Way.

In the Year 1694, by Order of the Government, our Peaſants took this laſt way to prevent a Torrent that attended the Eruption of *Veſuvius*. It threatened ſeveral Villages, but by the Diligence of the Labourers, the Miſchief was averted.

In the great Eruption of *Ætna* in 1669, the Inhabitants of *Catanea* ſucceeded, by uſing both theſe Expedients againſt the Torrents that roll'd from its Summit, as *Borelli* has deſcribed. (g)

However, we muſt own, that theſe Expedients can only ſerve where the liquify'd Fluid runs without Precipitation; for where it falls precipitately, or with any Degree of Impetuoſity, we believe no Obſtacle can ſtop its Fury; for we find from *Borelli*, in ſuch a Caſe, it broke through a Hill, which tho' form'd of looſe Earth, yet required

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(g) The fiery Matter now approached the City of *Catanea*, and the publick Danger alarmed every Body to uſe all their Art to ſave their Effects. Amongſt others, D. *Xavier Muſumeci*, a learned and ingenious Man; D. *Diego Pappalard*, Prieſt of the Order of St *John* of *Jeruſalem*, and Signior *Giacomo Platania*, a skilful Painter, bethought themſelves of a Method to avert the Calamity that threatened this beautiful City. D. *Diego* ſignalized wonderfully his Courage and Prudence on this Occaſion: He cauſed the Torrent to be pierced in ſeveral Parts towards its W. Side, near the Mouth. The Labourers broke the Cruſt with vaſt Hammers, drawing out the hot Stones with Iron Crooks: They were covered with Skins to ſecure themſelves from the Fire, and ſtill ſupplied by freſh Workmen, ſo that by Dint of Labour, the fluid interior Maſs being let out, chang'd its Courſe. When it approached nearer the City, they ſtopp'd it with ſtrong Ramparts of Stone, lined with Earth, ſo that the Torrent threw itſelf into the Sea, where it forms to this Day a Key or Mole near a Mile in Length.

TABLE I.
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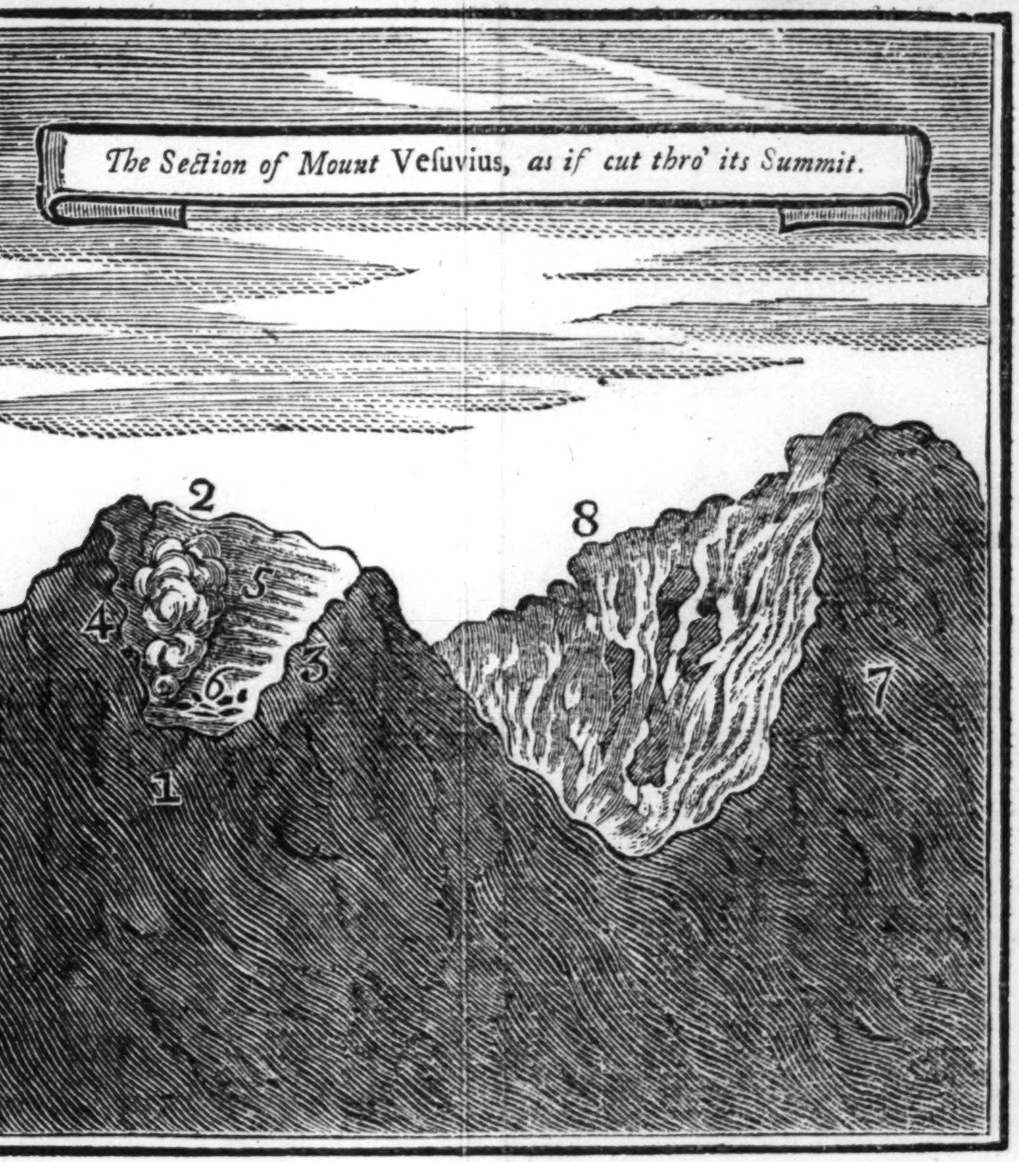
2. The Baſon or Cavity t
Summit ſince the laſt E
3. An eaſy Deſcent to th
the Bottom of this Cav
4. A Deſcent to the Weſ
ſteep as to be impractic


The Section of Mount Veſuvius, as if cut thro' its Summit.
2
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5
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I. *Explanation of the Plate that repreſents the Section of Mount* Veſuvius *as if cut thro' its Summit.*

erture or Top from which the
ſues.
r Cavity that appears from the
the laſt Eruption.
ent to the Eaſt, which leads to
this Cavity or Baſon.
the Weſt, but broken, and ſo
impracticable.

5. The Inſide of the Baſon, which is all burnt and cover'd with Rocks.
6. The Bottom of the Baſon, quite inacceſſible, becauſe it partly receives the Rain Water, and the reſt of it is full of Crevices and Holes that continually exhale Smoke.
7. The other Top of *Veſuvius* to the North.
8. Rocks to the North Side, that partly incircle the Volcano.

required a vaſt Force to penetrate its Sinuoſities.

Perhaps theſe Expedients may ſeem ridiculous to ſome, either as impracticable, or obvious to every one. Experience ſhews the former to be falſe; and as to the ſecond Objection, we ſhall only hint, that we thought it proper, however eaſy theſe Methods may ſeem, to mention them, as they relate ſo nearly to the Point in which the Publick Safety is immediately concerned.

As his Majeſty deſigns a Palace at *Portici* (in the Neighbourhood of our *Volcano*) we have mention'd theſe Methods for averting the Fury of our *Lavangi*, as well as the Expedients for preventing the Danger of the *Moffetti*, laid down in the preceding Chapter, that they may contribute to render this Place more ſecure and agreeable.

FINIS.